SOUTHERN POWER AND INDUSTRY

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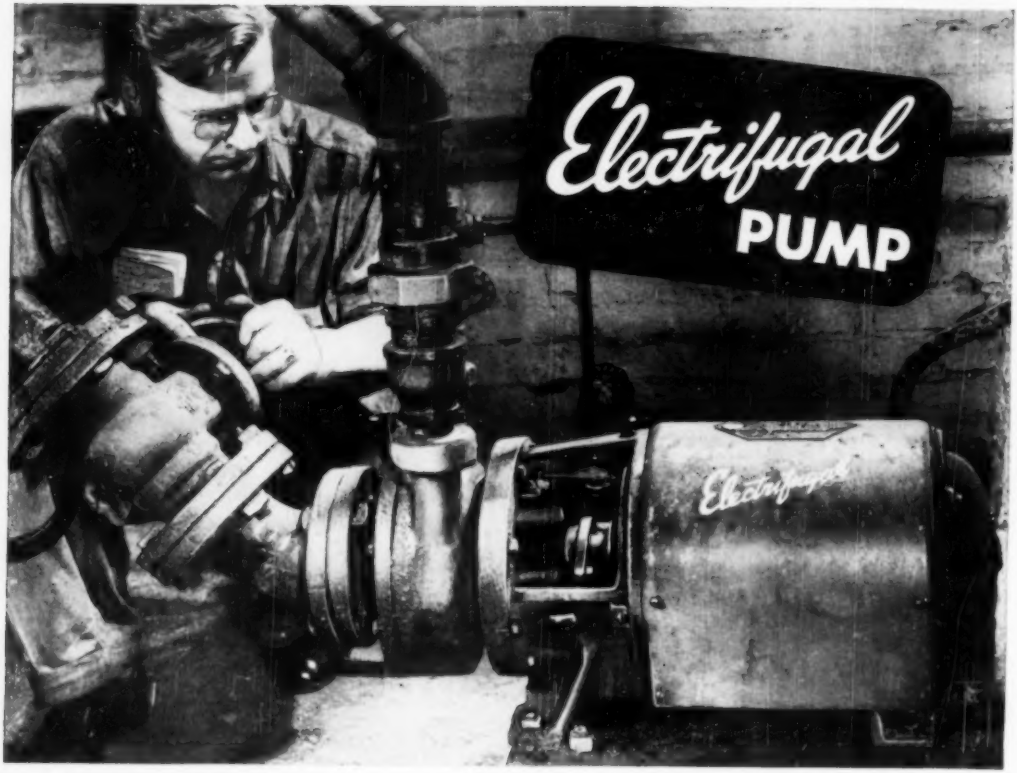

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Volume 68 Number 2

Nearly every plant has need for a bucket elevator—lifting material up into the air so that something else may be done with it. A certain height — certain capacity — certain results. There is a bucket elevator in the broad Jeffrey line to do that job to your complete satisfaction. Standards have been worked out—to save you time—to save you expense in making layouts. Complete drawings to suit each particular elevator. We will go into detail.

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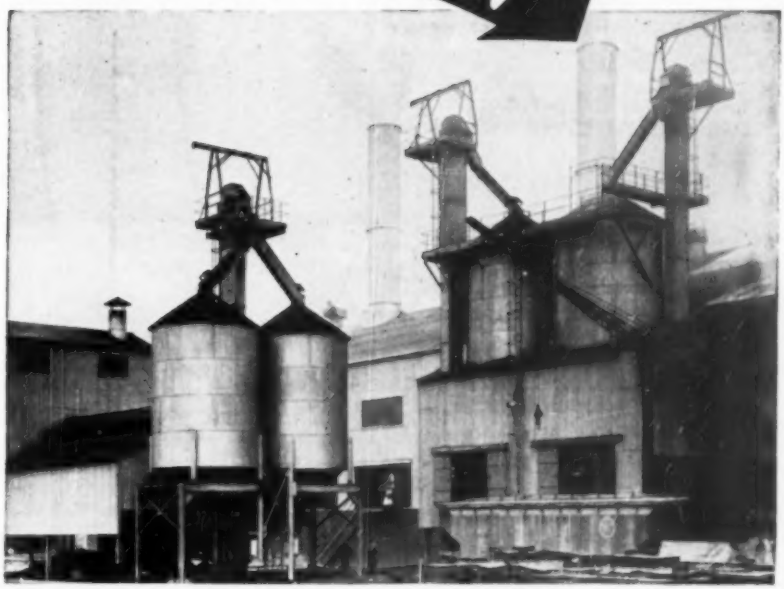

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SOUTHERN POWER AND INDUSTRY

Vol. 68 No. 2 FEBRUARY 1950

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Editorial and Executive Offices: **SOUTHERN POWER & INDUSTRY, 806 PEACHTREE ST., N. E., ATLANTA 5, GEORGIA**

A Compact New Starter for Fractional Hp Motors

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Facts and Trends

FOR SOUTHERN INDUSTRIAL AND POWER EXECUTIVES

February, 1950

MIAMI, FLORIDA'S RAW WATER SUPPLY is pumped from wells. Softening and color removal is accomplished by lime treatment and alum coagulation. When the treatment plant is running at its daily rated capacity of 60 million gallons, over 54 tons of lime are required per day. Prior to 1949, this was shipped in at the cost of $18 per ton.

A new $785,000 plant is now recovering the lime needed for this water treatment from the sludge formed in the water treating process. Capacity is 60 to 80 tons per day and the plant is now selling the excess to other cities. A yearly saving of around $90,000 is expected.

THE $57 MILLION LOUISVILLE, KENTUCKY WORKS, producing three low-powered farm tractors, is the largest single investment of the International Harvester Company. One of the most unique features of the plant is the vast installation of induction heating equipment in the forge shop. It is one of the biggest producers of high frequency power (total capacity: 6,280 kw) for industrial use in the world.

THE PORT OF HOUSTON, TEXAS, rolling up a record-breaking total of over 38 million tons of cargo, was the second largest port in the U. S. during 1948, according to official tentative figures of the U. S. Army Engineers on major ports of the nation. Houston gained the coveted number two slot by passing Philadelphia and Baltimore in total tonnage. New York is the perennial number one port of the nation.

BIRMINGHAM, ALABAMA, as is the case of so many other industrial cities, lies in a valley. Consequently, smog conditions are often created, which forcefully reminds every citizen that "something should be done about that smoke". This continued agitation has borne some fruit, and an excellent job of smoke control is being done in the area. "Application of Over Fire Air Systems" in this issue of SP&I discusses some of the varied problems and their solutions.

NEW MEDIUM FOR EXTINGUISHING FIRES in flammable liquid storage tanks and similar hazards is AER-O-FOAM liquid--a hydrolyzed protein manufactured from a soya bean base. When mixed 6 per cent by volume with water and aerated, material forms a homogeneous tenacious foam blanket, which flows around obstacles and quickly extinguishes fires involving gasoline, benzol, naptha, etc. Photographs of the first industrial application of this type of fire protection are carried in this issue.

OKLAHOMA GAS & ELECTRIC COMPANY, having the country's first central station gas turbine (a 3500 kw, G.E., simple cycle, unit), reported in the December issue of SP&I that the unit has exceeded all expectations in its first four months of actual service operation and has many times operated above its rated capacity. Installational views, detailed cost figures, and operating data were featured in this article.

In another utility, the first fully AUTOMATIC SELF-STARTER FOR A GAS TURBINE in central station service has been completed. A 3500 kw, G.E., gas turbine, fueled by bunker C oil, will be put through its normal starting and stopping sequence by the automatic equipment. After reaching normal speed the unit is controlled by the operator in the same manner as a steam turbine to synchronize the generator with the bus. Protective features provide emergency shutdown in case of abnormal temperatures, fuel and air pressure.

THE WORLD'S LONGEST SINGLE CONVEYOR BELT used for transporting coal at the Weirton Mine of the Weirton Steel Company near Morgantown, W. Va., measures

10,900 ft between centers of head and tail pulleys. The Compass-150-Steel cord belt will haul coal from the washery located near the mine through a tunnel in an adjacent hill to a tipple on the Monongahela river for loading into barges.

The belt is 30-in. wide and will deliver approximately 250 tons of coal per hour while conveying at a speed of 300 fpm and will be driven by a 200 hp motor. A lump of coal dropped on the belt at the washery end will dump into a waiting barge on the Monongahela river 36 minutes later.

ONE LEADING ALUMINUM PRODUCER is now offering high-purity GALLIUM, a rare silvery-white metal. Gallium becomes liquid on a warm day, (melting point, 86 F), but does not boil until heated to about 3.600 F. Its unusual properties suggest many intriguing possible applications.

3 FT DIAMETER "GRANDADDY" SAND SUCTION AND DISCHARGE HOSES, produced in 20 ft lengths, will be installed on "dust pan" type dredges that are working the Mississippi. Consisting of 15 plies of rubberized fabric and a coil of $\frac{7}{8}$-in. copperized steel wire for reinforcement over a 1-in. tube of natural rubber, the finished hose units weigh over 8,000 lb each--690 lb of cotton, 2813 lb of compounded rubber, 2,287 lb of copperized steel wire, 2,200 lb of steel in hose nipples, and 90 lb of steel clamps. Outside diameter at the nipples is 47-in.

AT PORT COMFORT, TEXAS, the new reduction plant under construction by Alcoa is practically completed and will soon be in production. The company has also shut down and dismantled its obsolete Niagara Falls, New York plant built in 1907.

A CLEVELAND, TEXAS LUMBER COMPANY has cut curing time from 72 to 62 hours in one of their three-unit lumber kilns. Fiberglas roof insulation, one and one-half inches thick, was laid on the kiln's concrete roof deck and covered with standard built-up roofing.

NEW ELECTRONIC TORCH, combining high-frequency radio signals and various gases, will produce temperatures higher than the melting point of tungsten, which is 3370 C. Heart of the torch, still in the laboratory stage, is an electron tube which produces radio waves of one billion cycles per second. Leading from tube is an antenna made of two short metal cylinders, one within the other. High-frequency arc can be made to form on end of antenna. When nitrogen and carbon dioxide are fed past the arc, the electronic torch results.

CORONA FREE INSULATION has been developed by one leading electrical equipment manufacturer to the point where it is now used on transformers from 230 kv down to the lowest transmission voltages. Dielectric moulding of insulating collars has continued to give superior quality of close fitting insulation--the key to the new design. Manufacturer reports that this design has been so successful that not one transformer winding failed to pass impulse tests, during the last year's production, in spite of the fact that over 75 per cent of the large transformers produced were impulse tested.

ORGANIC FINISHES can be sprayed with superheated steam instead of compressed air by a new process which is still in the experimental stage. Several plants have been using the process for some months and claim several advantages.

The paint is both heated and atomized at the nozzle - thus eliminating need for preheating. Higher viscosity paints can be used and faster work is possible. Some trouble with conventional guns has been encountered, but new designs are expected to overcome these difficulties, as experiments progress.

Write the editors for additional information on any of the above items.
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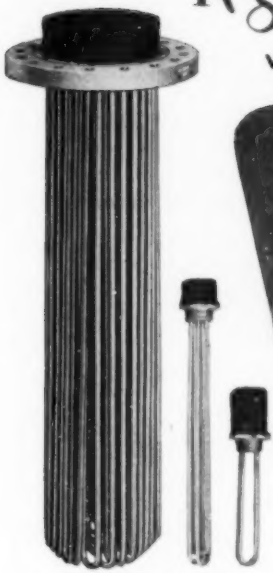
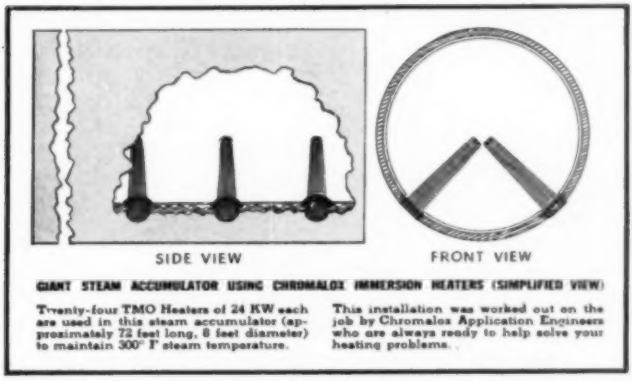


TMO Type Immersion Heaters are made in sizes up to 75 KW to operate in temperatures up to 800° F. and pressures up to 600 pounds.

CHROMALOX Tubular Immersion Heaters are used for heating compressed air and other gases: for super-heating steam; for heating liquids and Dowtherm, Prestone and similar heat-transfer mediums. They can be readily applied to high-temperature and high-pressure operations.

CHROMALOX Electric Immersion Heaters give you the *exact* temperatures you require and maintain these temperatures accurately. Dependable performance, economical operation, reduced spoilage are among other advantages gained by using these easy-to-install heaters.



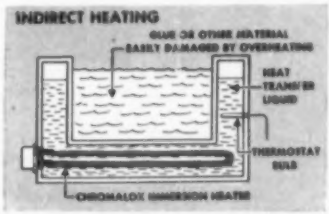
GIANT STEAM ACCUMULATOR USING CHROMALOX IMMERSION HEATERS (SIMPLIFIED VIEW)

Twenty-four TMO Heaters of 24 KW each are used in this steam accumulator (approximately 72 feet long, 8 feet diameter) to maintain 300° F steam temperature.

This installation was worked out on the job by Chromalox Application Engineers who are always ready to help solve your heating problems.

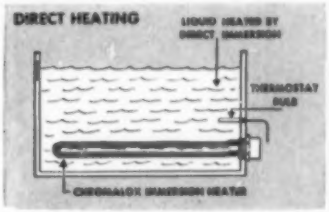
Typical Examples

of a few of the many uses for Chromalox Immersion Heaters



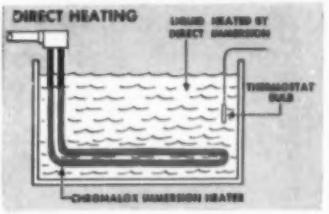
WATER OR OIL JACKETED KETTLES

Heaters are quickly and easily mounted in kettle wall; temperatures are accurately maintained manually or by automatic control. Uniform heat transfer makes this application particularly good for liquids that must be heated slowly to prevent damage by overheating.



HEATER MOUNTED PERMANENTLY IN TANK

Chromalox Immersion Heaters are welded or bolted through tank wall. Heaters are sheathed in copper, steel or alloy—as required to defeat corrosion. Temperatures are controlled thermostatically. Heat is absorbed directly and efficiently.



FOR HEAVY-DUTY IMMERSION HEATING

Low-density Immersion Heaters are especially designed for high-temperature melting-pots or salt baths. Heaters have legs to raise elements above sludge accumulation. They are quickly installed and easily removed for maintenance.

Want more Examples?

Request the fully-illustrated booklet "100 Ways to Apply Electric Heat." It contains photographs and drawings showing Chromalox Electric Heaters at work in plants throughout the United States. Write today for your copy.

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194	200	202	203	206	212	217	224	227	228	272	276	284	307	312	313	316
367	403	435	423	439	465	479	493	505	507	529	530	542	573	578	595	603
632	635	640	644	671	681	707	713	717	742	770	786	805	810	811	820	836
845	849	851	1020	1031	1035	1047	1048	810	811	812	813	814	815	816	817	818
819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835

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1020 **SUPERCHARGED GAS DIESEL ENGINES**—Bulletin 3-45—Gives complete specifications and data and supercharged gas Diesel engine, vertical four cycle, 6 and 8 cylinder, stationary speed low exceptional fuel savings.—THE COOPER BESSEMER CORP.

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Continued on page 144

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845	848	851	1020	1031	1035	1047	1048	510	511	512	513	514	515	516	517	518
519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535

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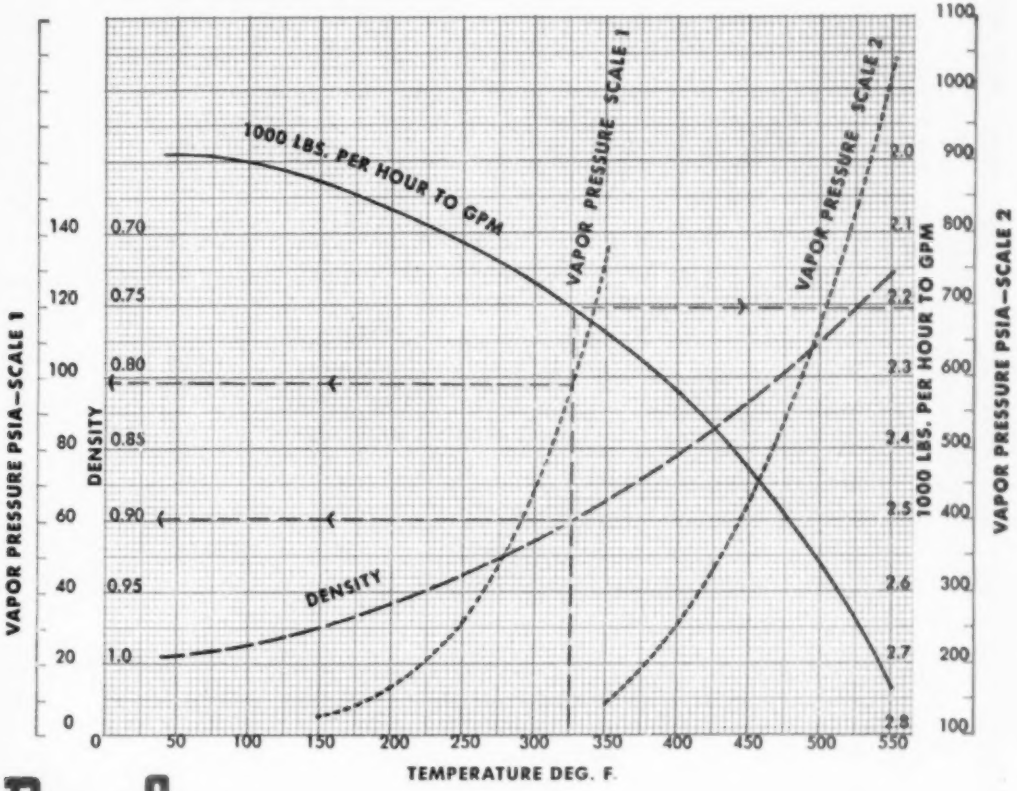

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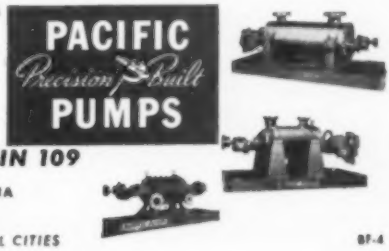

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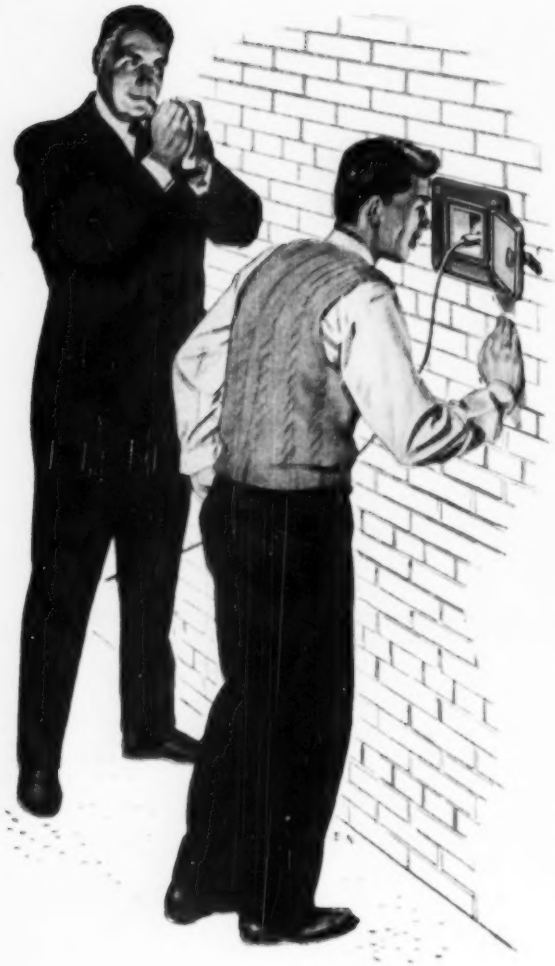

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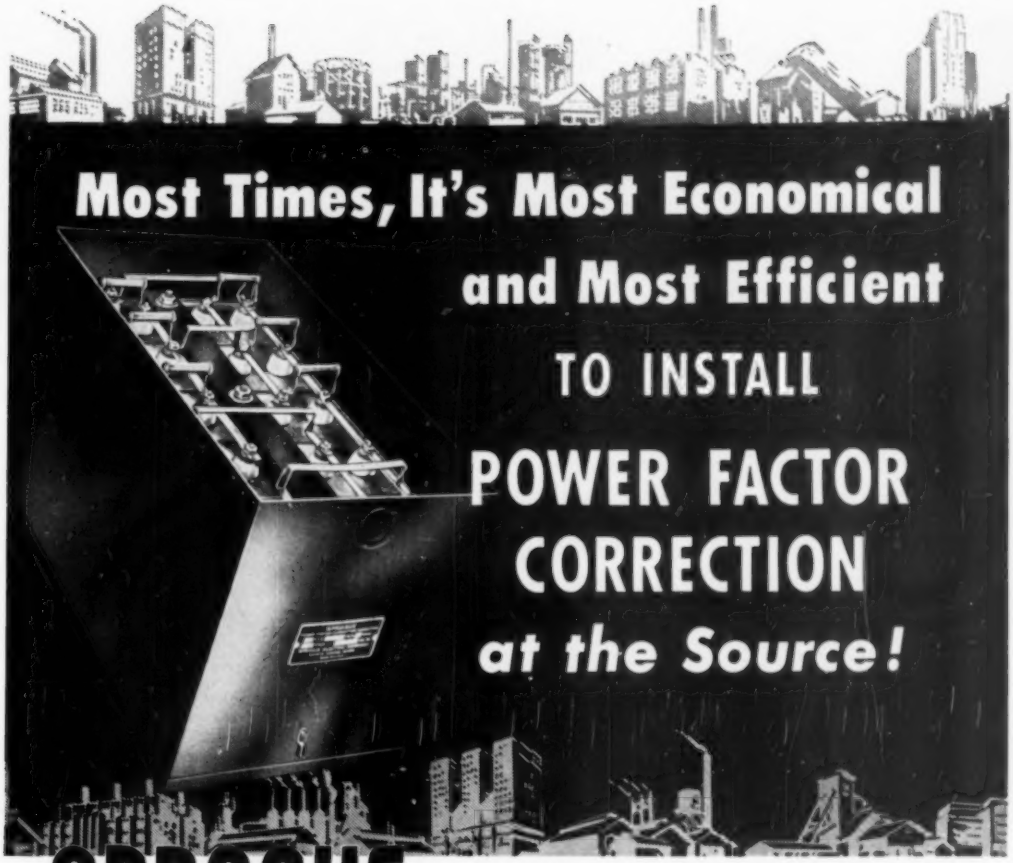

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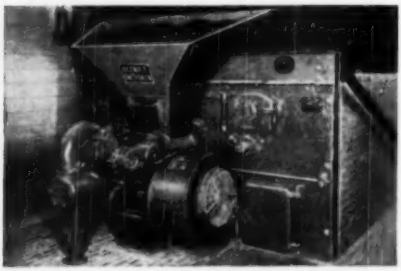
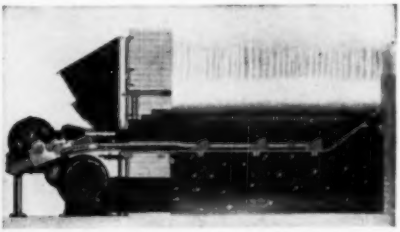
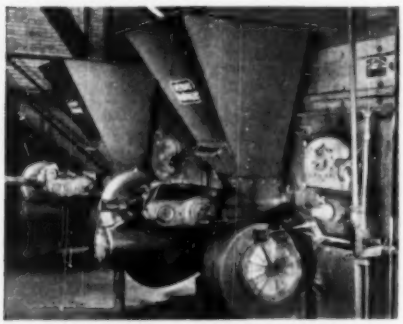


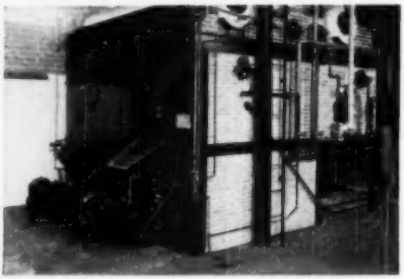
Detroit UniStokers in Miller Vocational High School, Minneapolis, Minn.



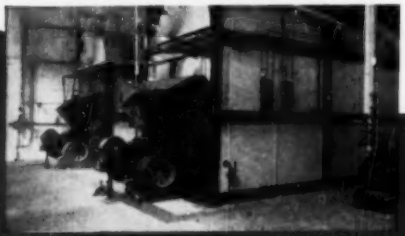
Detroit UniStoker has a deep sectional retort of large capacity. Arrows indicate flow of air for combustion.

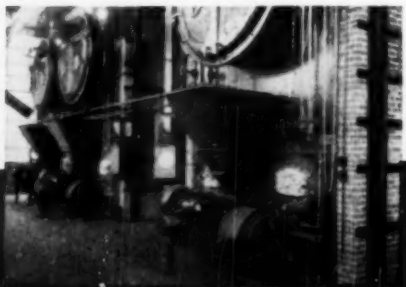


Detroit UniStokers—Industrial Arts Bldg. Barberton, Ohio, High School.



Detroit UniStokers Firing Three Drum Bent Tube Boilers—Ashtabula Hospital, Ashtabula, O.





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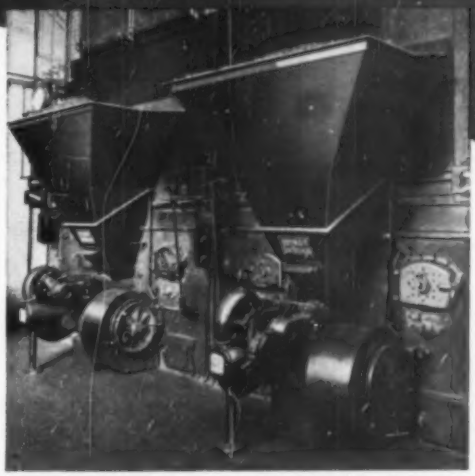
"Our Detroit UniStoker Is Saving Annually More Than 50% of Its Total Cost"—Says a paint manufacturer, who adds that smoke is no longer a problem.

"Four UniStokers Reduce Operating Costs $5,000 Per Year"—A rubber company which is a heavy user of process steam.

"Saving in Coal Consumption 35%"—Is the report from a brewery using UniStokers.

"$1,367 Saved First Year"—Record of UniStoker operation in a Sanatorium.



Detroit UniStokers in a State Educational Institution in Lock Haven, Pa.

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GENERAL MOTORS BUILDING, DETROIT 2, MICHIGAN

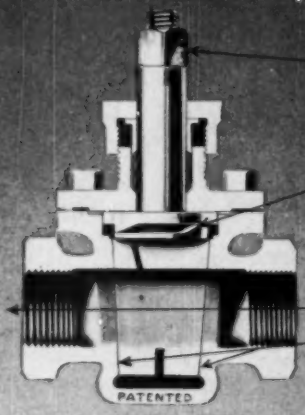
Works at Monroe, Michigan; District Offices in Principal Cities

OTHER TYPES AND SIZES OF DETROIT STOKERS FOR EVERY INDUSTRIAL OR POWER NEED

Preferred for over 50 Years for . . .

LOW FIRST-COST
LOW MAINTENANCE
LONG SERVICE

and Quick, Positive Operation



1. Quarter-Turn fully opens or closes.

2. Cam serves as positive stop, and automatically seals valve against leakage by pressing seating surfaces firmly together.

3. Straight-line fluid flow. Minimum pressure drop.

4. Seating surfaces protected in both open and closed positions.

5. Homestead Cam-Seald Quarter-Turn Valves are made in straight-way, 3-way and 4-way types, and in metals for most valve needs; for pressures to 3,000 pounds, and temperatures to 750° F.

Besides being the most economical, maintenance-free, long service valves for handling air, water, gas, oil and other fluids, Homestead Quarter-turn valves are unsurpassed for quick, positive operation. A simple quarter-turn fully opens or closes them; and the patented Homestead cam holds seating surfaces in contact at all times. Seating surfaces are protected in both the open and closed positions so that corrosive fluids or grit cannot cause damage and valve failures. Straight, unobstructed fluid passage assures "full flow" and minimum line pressure drop.

To these important features add the rugged construction typical of all Homestead valves and you have the reason why hundreds of plants in all types of industry have insisted on Homestead Cam-Seald Quarter-Turn Valves for half a century.

HOMESTEAD
Cam-Seald
QUARTER-TURN
VALVES

For complete information write for Valve Reference Book No. 38.

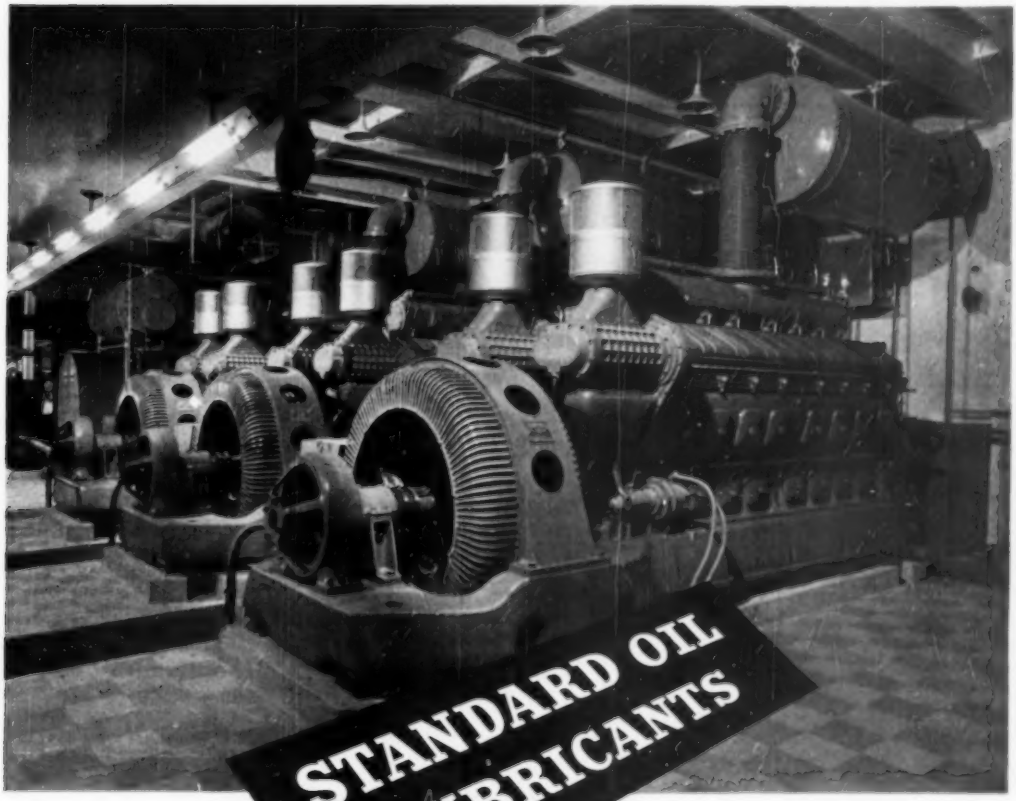
HOMESTEAD VALVE MFG. COMPANY

"Serving Since 1892"

P. O. BOX 70, CORAOPOLIS, PA.

no testing here

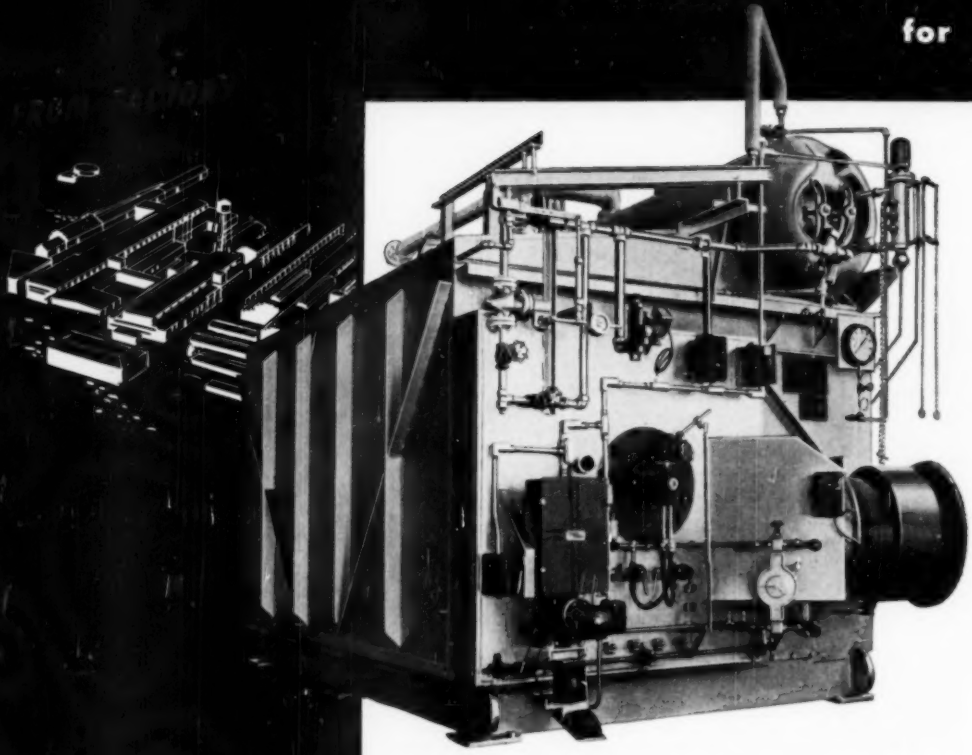
A DIESEL ENGINE is no place to test lubricants. For unless the lubricant is *specifically engineered* for the job at hand, it will be churned into a useless clogging sludge. Thanks to the world's largest facilities for the testing and research of petroleum products, you can know *in advance* exactly how Standard diesel oils will perform. Because they contain a special detergent and oxidation inhibitor, crank case and oil passages stay clean, carbon and gum formations are held to a minimum, rings work freely and exhaust ports remain clear. Find out for yourself how Standard Oil Diesel Lubricants can lengthen the periods between overhauls and help you make substantial savings in maintenance and lubrication costs. Call in a Standard Oil representative today.



STANDARD OIL COMPANY INCORPORATED IN KENTUCKY

Foster Wheeler Package

for



FACTORY ASSEMBLED STEAM PLANTS—Industry's need for small but efficient plants to supply power or process steam is fulfilled by Foster Wheeler *factory assembled water-tube steam generators* which can be shipped by common carrier, (truck, rail, or water) and readily installed. The labor necessary for installing a packaged unit is for the most part limited to service connections.

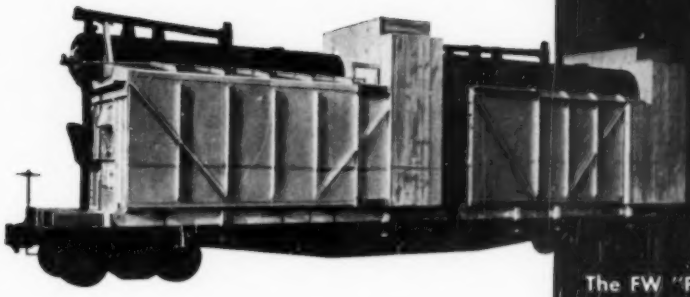
Foster Wheeler Package Steam Generators reflect the high engineering standards of an organization with over 50 years' experience in the art of steam generation and the manufacture and erection of power plant equipment. Therefore the purchaser of a Foster Wheeler Package Steam Generator is assured of skilled erection with proper assembly of any auxiliary equipment, high economy of steam production with any type of fuel, and efficient operation.

FOSTER WHEELER CORPORATION · 165 BROADWAY, NEW YORK 6, N. Y.

Assembled — Then Shipped

Units up to 35,000 lb per hr

Coal, Oil, or Gas Firing



Write for a copy of Bulletin PG-49-13d which contains drawings, sizes, and descriptions of Foster Wheeler Package Steam Generators.

The FW "Package" Contains
All These Features

Completely Factory Assembled.
Design pressures 300-500-900 psi.
Simplified water cooled furnace construction with low furnace temperatures.
Generous combustion chambers with low Btu release per cu ft of furnace volume for all types of fuel.
Positive natural circulation.
High thermal efficiency.
Choice of manual, semi-automatic or fully automatic controls.
Steel encased construction.
Drums with large volumes—manholes at both ends—factory-applied insulation.
Attractive exterior finish.
Minimum heat loss from radiation and air infiltration.
Sizes from 1500 to 35,000 lb per hr are plant assembled or field erected at customer's option.
Sizes from 40,000 to 50,000 are field erected only.

FOSTER WHEELER

How a roving Diesel power plant pulls away from expense!

Here is an unusual power plant that goes places and does things . . . savings-wise! The truck-mounted Diesel is a husky 8-cylinder, turbo-supercharged Cooper-Bessemer rated 450 hp at 720 rpm, direct-driving an AC generator.

This roving power plant and three others just like it, all Cooper-Bessemer equipped, belong to a progressive oil line company in the southwest. All four are used as *portable standbys* to permit the maintenance and overhaul of stationary main line units. They simply roll up to a station and go to work, supplying power to replace that of one of the regular units while the latter is shut down. Thus there's no need to provide for permanent standby power in each and every station. This extra expense burden is held to a practical minimum.

Whether your power needs call for portable or stationary service, for conventional Diesels, gas engines, or the revolutionary gas-Diesels, there are modern, efficient Cooper-Bessemers from 110 to 1800 hp that will fit your requirements to a "T"! Get in touch with the Cooper-Bessemer office near you for helpful cooperation.

The
Cooper-Bessemer
Corporation

MOUNT VERNON, OHIO — GROVE CITY, PENNA.

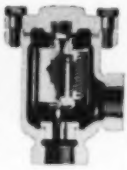
New York Washington Tulsa Dallas Seattle
St. Louis Houston Los Angeles Shreveport
Calmes Engineering Company, New Orleans, La.

How to be Right the first time

WHEN SELECTING STEAM TRAPS

No single type of trap is suitable for all applications. But one of the four distinct Sarco types will be exactly right for any given application. Some provide quicker warm ups in the morning, some extract more of the heat, some are better for fluctuating condensate loads and others are better for out of doors. Sarco has the only plant devoted exclusively to complete lines of steam traps and temperature controls. To be sure, the first time, see Sarco first.

A THERMOSTATIC



Wide open when cold for quick starts. Retains more of the heat before releasing condensate. Large valve orifice purges air quickly when starting. No seat changes when pressures change. Cannot freeze. Two types—for low pressure heating and high pressure industrial service up to 300 psi. Bulletin No. 250.

B FLOAT

Ball float allows continuous discharge without shock to temperature controls and other instruments. Automatic thermostatic by-pass takes care of air and gases without steam waste. All pressures up to 200 psi. Bulletin No. 450.

C BUCKET

Intermittent, but very rapid—can handle large volumes of condensate. Air goes out with the condensate. All parts attached to cover provide easy inspection. Straight-through connection makes installation easy. Integral strainer inside. Standard sizes to 250 psi. Forged steel types to 900 psi, and superheat. Bulletin No. 350.

D LIQUID EXPANSION

A low cost combination of trapping and approximate temperature control. Ideal for outdoor tanks and lines and other points where condensate cannot be returned. In other forms, used as combination trap and control for wash tanks, food equipment, etc. Catalog Nos. 250 and 550.

APPLICATION	1st CHOICE	2nd CHOICE
Process Tanks, small	A	C
Process Tanks, large	B	C
Dryers, Coil Type	B	A
Dryers, Fan Type	B	C
Drying Tumblers	B	A
Water Heaters	B	C
Preheaters, Fuel Oil	B	C
Rotating Cylinders	B	B
Slashers	B	B
Dry Cans	B	B
Flat Work Ironers	C	B
Presses, Laundry	C	A
Stocking Forms	C	A
Presses, Plastics	C	A
Presses, Platen	C	A
Evaporators	B	C
Steam Lines Outdoors, small	A	D

Ask for Bulletin No. 1600 "Selecting Steam Traps"

SAR

SARCO COMPANY, INC.

Represented in Principal Cities

Empire State Building, New York 1, N.Y.

SARCO CANADA, LTD., TORONTO 5, ONTARIO

SARCO SAVES STEAM

IMPROVES PRODUCT QUALITY AND OUTPUT

TERRY

QUICK-STARTING
TURBINE
FOR FEED PUMP
EMERGENCY DRIVE

The turbine shown at the right picks up the feed-pump load in case the motor, which normally drives the unit, is inoperative. Thus the turbine must be able to start quickly and be completely reliable —characteristics which are assured by the generous blade clearances and one-piece construction of the Terry Wheel.

This is but one example of many special turbine requirements that are met by the Terry solid-wheel turbine. Details on how this and other Terry Turbines will meet your individual needs will be gladly supplied by a Terry engineer.

DATA

The turbine is 620 hp, 3550 rpm for 850 psi, 900F steam with 2.5 psi back pressure.

Installed in the Crawford station, Middletown, Pa., Metropolitan Edison Co. Gilbert Associates, Inc. were the consulting engineers.

T-1178

THE TERRY STEAM TURBINE COMPANY
TERRY SQUARE, HARTFORD, CONN.

the HARD WAY

to solve your water conditioning problem —

Consider these factors: *Source of water*: Degree of hardness, alkalinity, turbidity, mineral and organic impurities, sludge forming characteristics, corrosiveness, seasonal variations, temperature ranges, etc. *Results required*: Degree of clarity, softness, alkalinity, residuals, stabilization, purity, taste and odor correction, iron removal, corrosion control, blended water, etc. *Method of treatment*: Water softener, chemical feed, concentration control, aeration, filtration, deconcentration, oil removal, pre-treatment, post-treatment, dealkalization, combination system, modernization of existing equipment, investment cost, etc. *Operating factors*: Cost, savings versus investment, operating skill required, critical limitations, plant balance, load factors, operating ranges, space requirements, etc.

and the EASY WAY: *call on* ELGIN!

We show above just a partial listing of the factors that often must be considered in solving a water conditioning problem. Our purpose is not to worry you with complexities, but to show you how unsound it is to entrust your water conditioning problem to an organization that is limited in experience and in scope of methods and equipment.

Naturally if the organization is limited to zeolite softeners, the solution proposed to your problem will be zeolite softeners . . . if limited to chemical treatments, the proposed solution will be chemical treatments . . . and so on down the list.

On the other hand, Elgin (utilizing all authoritative methods) is bound to no method but the *BEST*. For example, the most spectacular of all Elgin achievements is the dollar-saving Elgin "Double-Check" Softener described opposite . . . yet . . . you can't buy it unless an analysis of your condition convinces us that it is both the best and most economical solution of your water conditioning problem! And this holds true for every product in the Elgin line.

Yes, through Elgin you get the counsel of a firm that has seen enough conditions to *recognize* your needs; the counsel of a firm that is in a position to apply the method that exactly *suits* your needs. For a complete check-up of your requirements there is no cost or obligation whatever.

ELGIN "Double-Check" WATER SOFTENER

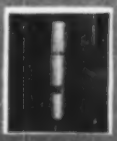
By preventing loss of zeolite the "Double-Check" design of the Elgin Softener permits a far larger bed of zeolite and utilizes it more efficiently. Result: 44% more soft water per regeneration than other softeners of same size using same type zeolite. "Double-Check" principle is also adaptable (at low cost) to your present softener of any make.

FILTERS — PURIFIERS

Elgin Water Filters and Purifiers for any filtration or purification requirement. Pressure Filters, with quartz or non-siliceous filtering medium, remove suspended impurities, including iron in suspension. Taste and Odor Removal Filters remove bad tastes and odors, including chlorine.

CHEMICAL FEED SYSTEMS

Many water conditioning problems are best and most economically solved by feeding the right chemical treatment in the right way. Elgin chemical treatments, individually formulated to meet specific conditions and properly fed by dependable Elgin chemical feeders, may prove to be the best answer to your needs.



DECONCENTRATORS

The Elgin Deconcentrator keeps boiler water clean—rids boiler of sludge, mud, and scale-forming matter — eliminates wasteful blowdown—cuts water treatment costs. Impurities are trapped in sedimentation chamber and eliminated in concentrated form.

ELGIN SOFTENER CORPORATION

132 North Grove Avenue

Elgin, Illinois

ELGIN ECONOMICAL WATER CONDITIONING

ASK FOR NEW BULLETIN 610 "ELGIN WATER CONDITIONING" GIVING FACTS YOU NEED.

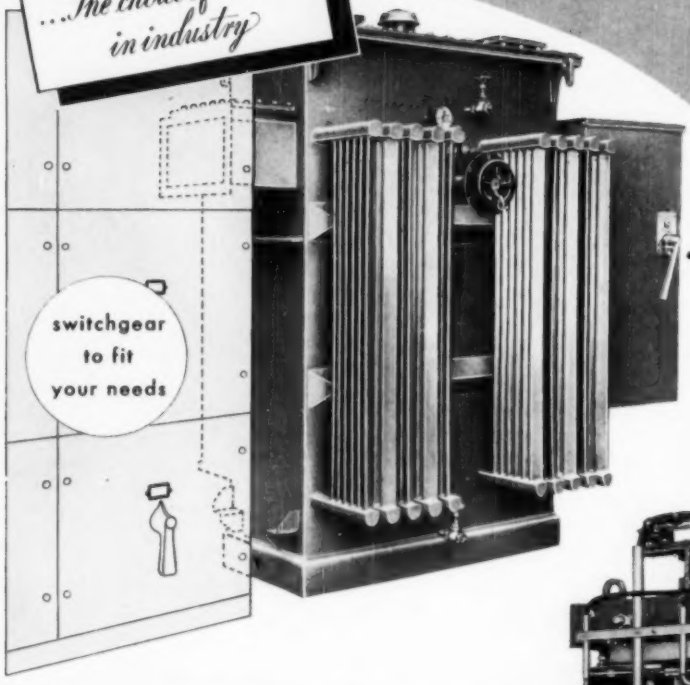
SOFTENERS • CHEMICAL TREATMENT • FILTERS • BOILER WATER CONDITIONING

WAGNER TRANSFORMERS
...The choice of leaders in industry

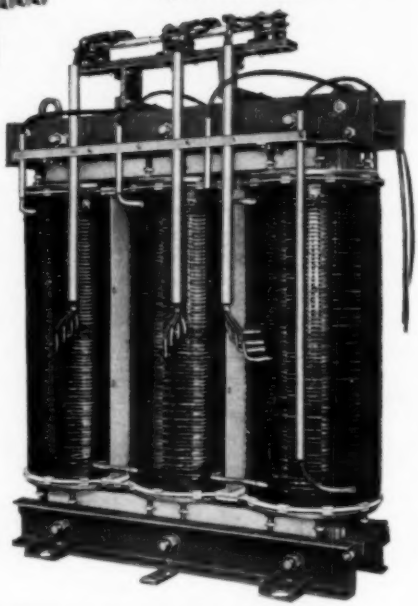
Wagner Unit Substation Transformers

designed to meet your distribution requirements

switchgear to fit your needs



Core and coil assemblies of Wagner unit substation transformers are designed by experienced engineers, and built and tested by skilled workers. Highest quality materials are used throughout, and meticulous attention to detail marks each step in their construction.



The transformer is the vital part of a load center distribution system. If the transformer fails, the entire system is dead whereas only part of the distribution system is affected by the failure of a switch or circuit breaker.

You can be sure of a dependable continuous flow of power from a Wagner transformer and you can be sure that it has been carefully designed to meet your distribution requirements.

Wagner unit substation transformers with incoming high voltage switch sections to meet your requirements, and with proper throats on the secondary side to connect to any make of switchgear, are available in the usual range of ratings up to 2000 kva. Our factory-trained sales engineers are well qualified to recommend the various combinations necessary to handle your unit substation requirements and they will be glad to give you immediate service.

Wagner unit substation transformers have been installed in all kinds of industrial plants including synthetic rubber, petroleum, steel, chemical, aircraft, automotive, paper, and many others. The importance of the transformer in a unit substation justifies calling in the Wagner sales engineer to help solve your load center problems.

Bulletins TU-13 and TU-56 describe the design and construction features that make Wagner liquid-filled and dry-type unit substation transformers outstanding.

WAGNER ELECTRIC CORPORATION
6383 Plymouth Ave., St. Louis 14, Mo., U.S.A.

Wagner Electric Corporation
EST. 1891

ELECTRIC MOTORS - TRANSFORMERS - INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS - AIR AND HYDRAULIC

BRANCHES IN 29 PRINCIPAL CITIES

T3944A

a beautiful
school for Kalamazoo

a fine
steam heating plant
by **WICKES**

The choice of progressive architects and engineers everywhere, Wickes Package Water Tube Steam Generators will be installed in this completely modern junior high school at Kalamazoo, Michigan. This imposing group of buildings will have a total of 40 classrooms with facilities for 1200 pupils. It is scheduled for completion in 1950 and will take its place as one of the finest junior high schools in the country.

Classroom comfort is an important factor in any school, and the three oil fired Wickes Package Water Tube Boilers, equipped with stub stacks and induced draft fans for efficient, economical operation, can be relied upon for an uninterrupted flow of heat every minute of the school day.

Louis C. Kingscott & Associates, Inc.
Architects and Engineers
Kalamazoo, Mich.

C. L. Mahoney	**Miller-Davis Co.**
Heating Contractor	**General Contractor**
Kalamazoo, Mich.	**Kalamazoo, Mich.**

WICKES

THE WICKES BOILER CO.
SAGINAW, MICHIGAN, U.S.A.
DIVISION OF THE WICKES CORPORATION

SALES OFFICES: Atlanta • Boston • Charlotte, N. C. • Chicago • Cincinnati • Denver • Detroit • Fort Worth, Texas • Indianapolis • Jacksonville Los Angeles • Milwaukee • New York City • Peoria, Ill. • Pittsburgh • Saginaw • San Francisco • San Jose, Calif. • Seattle • St. Louis Tulsa, Okla. • Mexico City • **RECOGNIZED QUALITY SINCE 1854.**

C-E Vertical Boilers

Modern steam generating equipment can't lower the price of a ton of coal or a barrel of oil, but it *can* produce *more* steam from every ton of coal or every barrel of oil. The modern unit can't lower the cost of a man-hour, but it *can* and *does* operate so reliably that maintenance costs are kept at a minimum.

C-E Vertical-Unit Boilers represent truly modern standards of design. To an exceptional degree they incorporate all the important advances in steam generation made in the past twenty-five years . . . advances that have resulted in substantially increased efficiencies and lower operating costs. At today's high costs of fuel and labor, these gains in operating efficiency may well prove the difference that will make replacement a profitable procedure for you. So whether you are considering the purchase of equipment for replacement or expansion, or for a new plant, a C-E Vertical-Unit Boiler will provide the right answer to your particular situation.

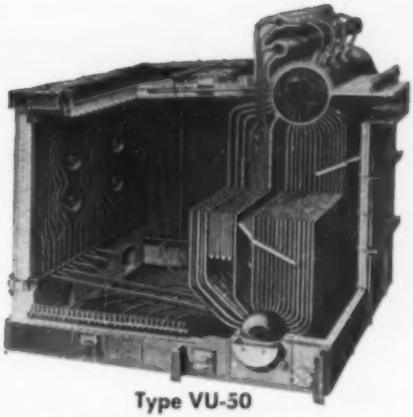
The three units illustrated—and others in the Vertical-Unit line not shown—are collectively designed to serve virtually every industrial requirement from about 10,000 to 300,000 (or more) lb of steam per hour, pressure up to 1,000 psi and steam temperatures to 900 F. The entire Vertical-Unit line offers the advantages of time-tested standards of design coupled with that flexibility of application—fuels, firing methods, operating conditions, etc.—required to meet particular plant needs. We shall be pleased to supply catalogs and any additional information required upon request. B-371

COMBUSTION ENGINEERING

A MERGER OF COMBUSTION ENGINEERING COMPANY, INC. AND THE SUPERHEATER COMPANY

-Unit

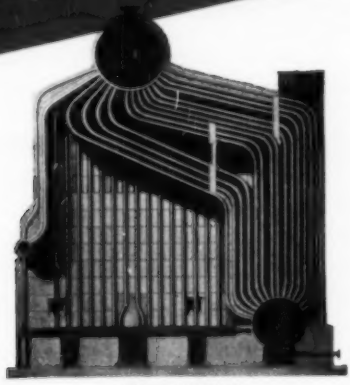
today's best answer to high steam costs



Type VU-50

(for the higher capacity range)

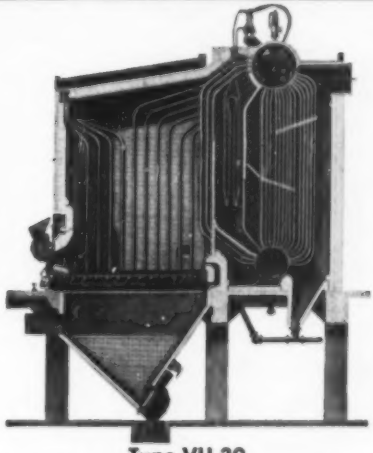
This unit, the original VU design, may be fired by pulverized coal, oil or gas, or any combination of these fuels. Available for capacities up to 300,000, or more, lb of steam per hr, pressures up to 1000 psi and steam temperatures up to 900 F, or higher. Furnace bottom may be as shown or may be of hopper type. Economizer or air heater surface may be added.



Type VU-10

(for the lower capacity range)

This member of the VU family is designed for industrial load conditions and particularly for plants having small operating and maintenance forces. Capacities range from about 10,000 to 50,000 lb per hr. Firing may be by spreader, underfeed or chain grate stokers, or by oil or gas burners. Any of these methods may be substituted for any other, should fuel market conditions make this desirable.



Type VU-30

(for the middle capacity range)

In this VU design, shown equipped with a C-E Spreader Stoker, the furnace proportions and arrangement of water wall surfaces may be adapted for firing by any type of mechanical stoker. Design is also adaptable for firing by oil or gas. Economizer or air heater surface may be added. Approximate capacity range 25,000 to 100,000, or more, lb per hr.

—SUPERHEATER, INC.

200 MADISON AVENUE, NEW YORK 16, N. Y.

The ABC's of Powell Valve PERFORMANCE

Fig. 1303 W. E.—Class 1500-pound Cast Steel Gate Valve with welding ends, bolted flanged yoke, outside screw rising stem and tapered solid wedge.

Fig. 1333-A — Class 1500-pound Steel Integral Bonnet Angle Valve with welding ends. Also available in Globe and "Y" patterns.

Fig. 241 — Large 125-pound Iron Body Bronze Mounted Globe Valve. Made in sizes 2" to 16", incl. Has outside screw rising stem, bolted flanged yoke and regrindable, renewable bronze seat and disc.

Fig. 500 — 125-pound Bronze Gate Valve with screwed ends, screwed-in bonnet, inside screw rising stem and tapered wedge; solid in sizes ¼" to ⅜", double in sizes 1" to 3".

Always the right valve. And, because Powell *can* always furnish the *right* valve, you can avoid failures that result from trying to make a valve "do" in a service to which it is not *specifically* adapted, as well as those caused by misapplication.

Built to last. Powell Valves are designed for long life at a minimum cost of maintenance. The cost of construction and materials of any Powell Valve is determined solely by the requirements of the service for which the valve is designed.

Complete Line. Powell Valves are made in all types such as Globe, Angle, "Y", Gate, Check, Non-return and Flush Bottom Tank. Materials include not only Bronze, Iron and Steel but also a wide range of Corrosion-Resistant metals and alloys.

Ask your nearest Distributor—or write direct

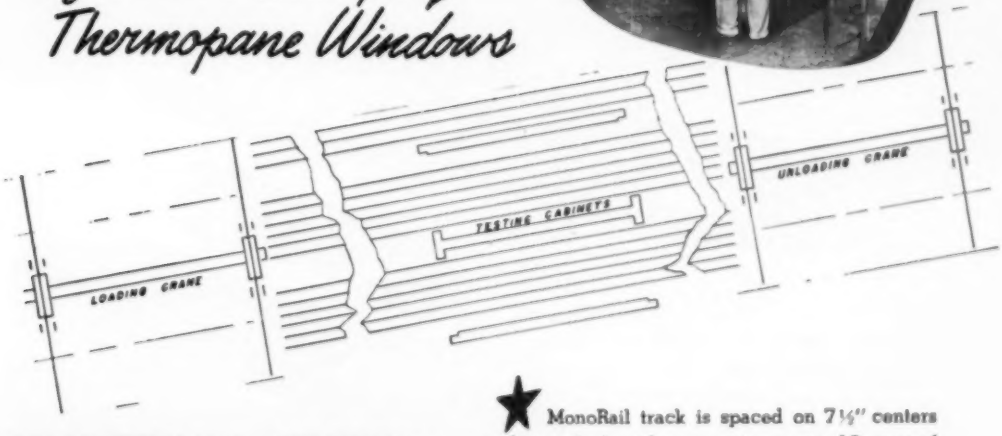
Fig. 3031 W. E. — Class 300-pound Cast Steel Globe Valve with welding ends, outside screw rising stem and bolted flanged yoke.

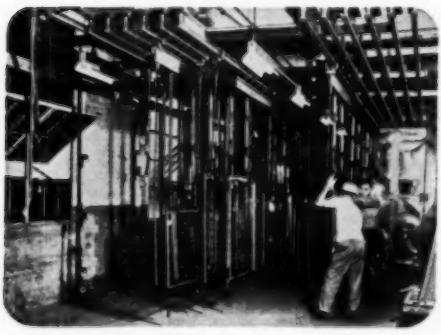
The Wm. Powell Company
Cincinnati 22, Ohio
DISTRIBUTORS AND STOCKS IN ALL PRINCIPAL CITIES

POWELL VALVES

AMERICAN MONORAIL

Permits Close Spacing of Tracks Carrying Thermopane Windows





PHOTOS COURTESY
LIBBEY-OWENS-FORD GLASS CO.
TOLEDO, OHIO

★ MonoRail track is spaced on 7½" centers with interlock with cranes to permit 12 rows of Libbey-Owens-Ford Thermopane windows to enter testing cabinets. Empty carriers are transferred from MonoRail crane across interlock to loading track. From loading through testing cabinets, carriers travel a distance of 121 feet. Track interlocks with crane in unloading area—empty carrier is returned by gravity on three tracks. From the simplest hand-operated unit to the most complicated fully automatic system, American MonoRail engineers can suggest a system best suited to your problems that will save you money.

THE AMERICAN MONORAIL COMPANY

13105 ATHENS AVENUE **CLEVELAND 7, OHIO**

"We stopped motor burn-outs and saved time and money for a large company..."

by Installing..

"Recently, while rewiring part of a large manufacturing plant here in Salem, we installed Fusetron dual-element fuses in motor-running protection size to back up the overload protection already installed on the motors.

"On several occasions, for some reason, these protectors failed to operate when they should have and the motor would have burned out except for the opening of the Fusetron fuses.

"The company's plant engineer was so impressed by the way these Fusetron fuses prevented damage to the motors and saved the company time and money that he authorized us to install Fusetron fuses throughout the entire plant."

Howard Firestone. Owner
FIRESTONE ELECTRIC COMPANY,
Salem, Ohio

Facts About FUSETRON Dual-Element Fuses

The fuse link element opens on short-circuit — the thermal cutout element protects on overloads — the result, a fuse with tremendous time-lag and much less electrical resistance.

They have the same degree of Underwriters' Laboratories approval for both motor-running and circuit protection as the most expensive devices made.

Made to the same dimensions as ordinary fuses — fit all standard fuse holders.

Obtainable in all sizes from 1/10 to 600 amperes both 250 and 600 volt types. Also in plug types for 125 volt circuits.

Their cost is surprinsingly low.

(FUSETRON is a trade mark of the Bussmann Mfg. Co., Division of McGraw Electric Co.)

Fusetron DUAL-ELEMENT Fuses

with their

10 Point Protection

1. Protect against short-circuits.
2. Protect against needless blows caused by harmless overloads.
3. Protect against needless blows caused by excessive heating — lesser resistance results in much cooler operation.
4. Provide thermal protection — for panels and switches against damage from heating due to poor contact.
5. Protect motors against burnout from overloading.
6. Protect motors against burnout due to single phasing.
7. Give DOUBLE burnout protection to large motors — without extra cost.
8. Make protection of small motors simple and inexpensive.
9. Protect against waste of space and money — permit use of proper size switches and panels.
10. Protect coils, transformers and solenoids against burnout.

Stop Wasting Time and Money-

FUSETRON
TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION
BUSS

FUSETRON Dual-Element Fuses Give ALL-PURPOSE PROTECTION

One needless shutdown — or one lost motor — or one destroyed switch or panel — may cost you far more than replacing every ordinary fuse with a FUSETRON dual-element fuse.

Don't risk such losses — protect yourself by installing a FUSETRON dual-element fuse in every set of fuse clips throughout the entire electrical system.

Bussmann Mfg. Co., University at Jefferson
St. Louis 7, Mo. (Division McGraw Electric Co.)

Please send me complete facts about FUSETRON dual-element Fuses.

*Name*_____

*Title*_____

*Company*_____

*Address*_____

*City & Zone*_____ *State*_____ 150

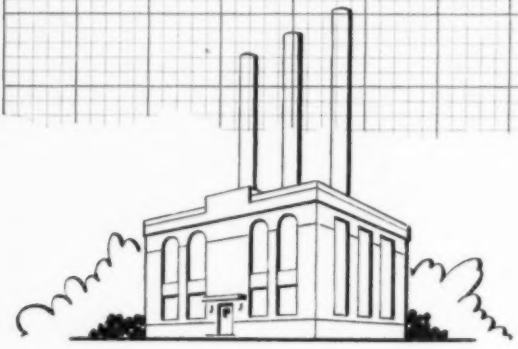
HYDRAULIC
AUTOMATIC MANUAL
GOLDEN-ANDERSON
POSITIVE CONTROL
Check Valves

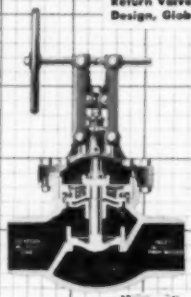
DEPENDABILITY

proven

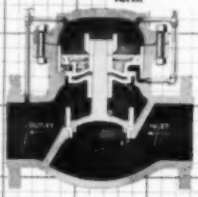
in the **POWER PLANTS**

of America

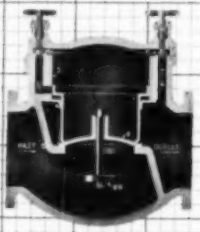




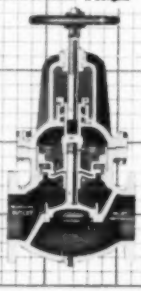
G-A Single Acting Non-Return Valve, Toggle Yoke Design, Globe Pattern.



G-A Automatic Hydraulic Check Valve, Globe Pattern.



G-A Double Cushioned Check Valve, Globe Pattern.



G-A Combined Throttle and Automatic Engine Stop Valve, Standard Yoke Design.

Years of long, hard usage is the absolute test for any Industrial or Power Plant equipment. Since 1905 Golden-Anderson Valves have earned a reputation for quality and dependability by giving *satisfaction plus* and safety in the toughest applications.

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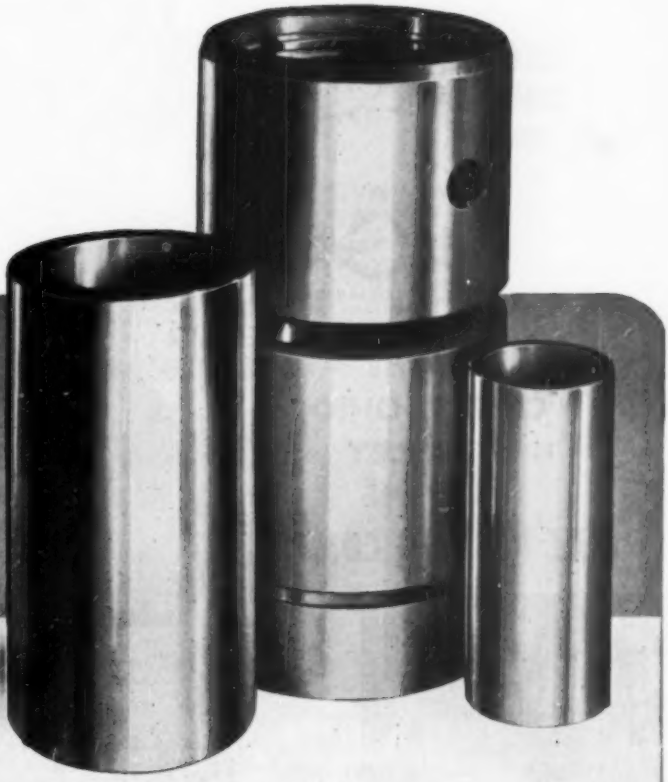

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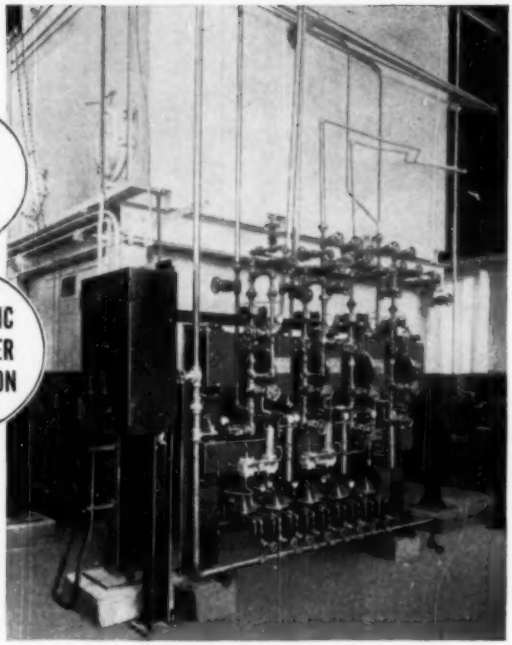
AUTOMATIC COMBUSTION CONTROL BY HAGAN

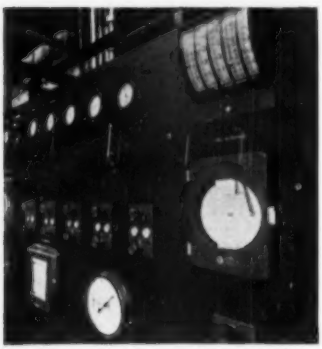
RING BALANCE METERS

AUTOMATIC FEEDWATER REGULATION

AT THE CLEVES, OHIO, REFINERY OF THE GULF REFINING COMPANY

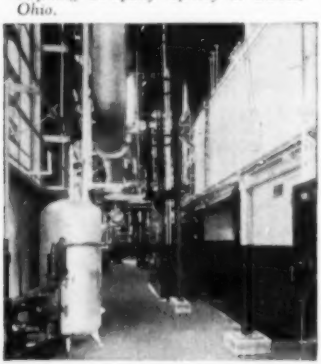


Components of the Hagan automatic feedwater regulation and combustion control systems are mounted at the side of each boiler, giving easy access for adjustment or servicing.



Separate instrument panels are provided for each boiler. Two Hagan Ring Balance Meters are mounted on each panel.

Below—*General view showing front of boilers and instrument panels in Gulf Refining Company refinery at Cleves, Ohio.*



Recent expansion of the refinery of Gulf Refining Company at Cleves, near Cincinnati, included the installation of two new boilers, each with a capacity of 70,000 pounds of steam per hour, and operating at 685 psi. Fuels used are refinery waste gas and oil, either singly, or in combination.

These new boilers are equipped with Hagan Automatic Combustion Control, Hagan Automatic Feedwater Regulation, and Hagan Ring Balance Meters.

The combustion control is a Hagan Differential Master system. With this system, waste gas is burned when available and is automatically supplemented or replaced by oil as necessary. Fuel feed is changed instantly to compensate for fluctuations in calorific value of fuel or changes in steam demand and excess air is automatically maintained in accordance with actual Btu. input.

Hagan Automatic Feedwater regulation is a multiple circuit system which proportions feedwater to steam flow and modifies feedwater flow in accordance with water level in the boiler. Thus the system not only holds water level accurately in a steady steaming state, but also "irons out" in an optimum pattern, the mutual disturbances existing between the steam generating circuits and the water flow circuits of the boiler in changing from one steam rate to another.

Two Hagan Ring Balance Meters are used with each boiler. One records steam flow, air flow and steam pressure; the other records feedwater flow and steam drum water level.

We will be glad to supply full information on Hagan Combustion Control, Hagan Automatic Feedwater Regulation and Hagan Ring Balance Meters. Write to Hagan Corporation, Hagan Building, Pittsburgh 30, Pa.

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Tough, easily handled, Type ANW-insulated, neoprene-jacketed cable incorporates six important advantages . . . important to you for underground duct installation.

1. Better heat and flame resistance—protected by the same neoprene jacket as Anaconda mining cables which must and do meet the severe flame test of the U.S. Bureau of Mines.

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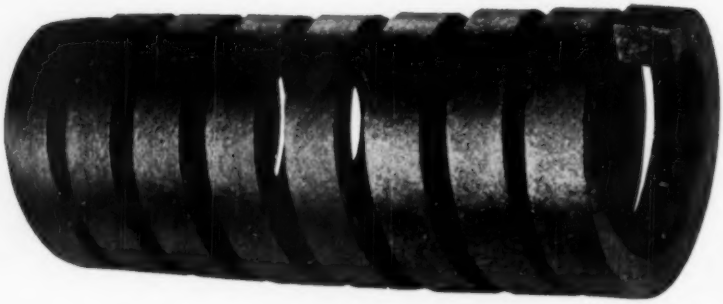

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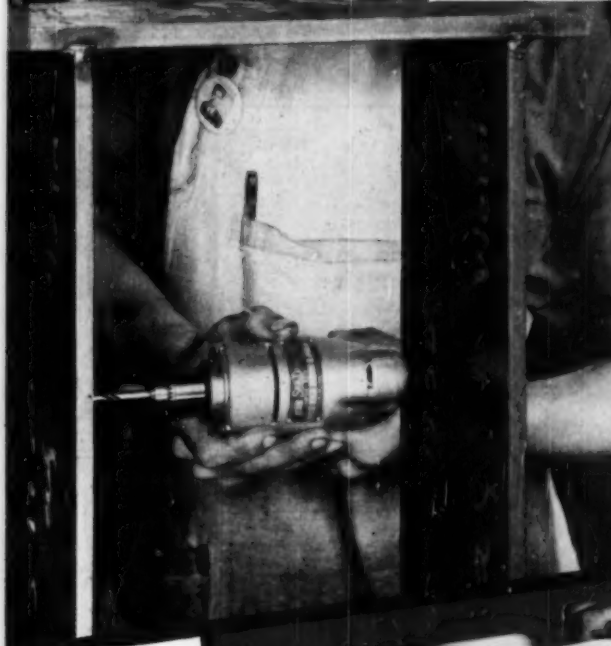

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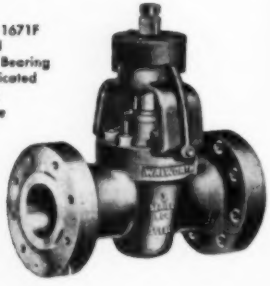

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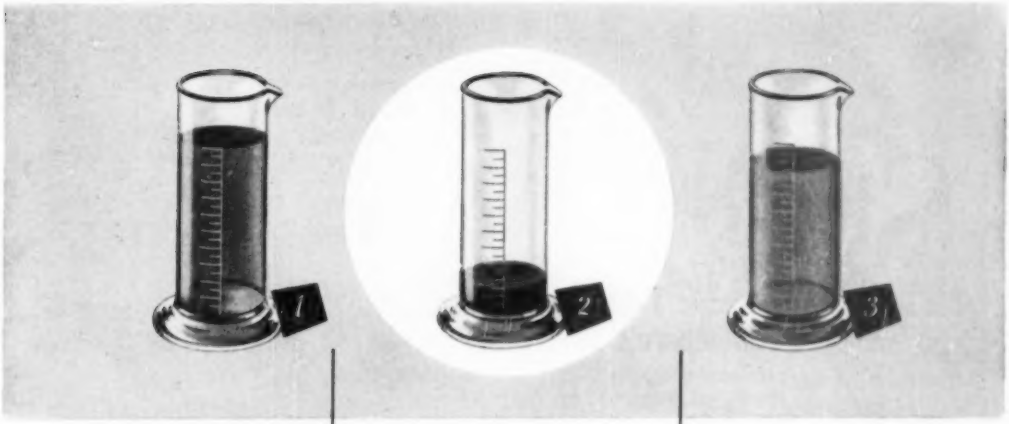
How Alchlor Process "Remove-ability"* gives Gulfcrest Oil its greater stability



In Cylinder 1 you see the oil that will become Gulfcrest. It has gone through the usual steps used in refining most other turbine oils—but has not yet been Alchlor-processed — an extra refining step that makes it extra pure and extra efficient.

* In Cylinder 2 you see the part—as much as 15%—which is discarded by the Alchlor Process. This is the part that, in ordinary turbine oils, is most likely to oxidize, increase neutralization number, and form sludge, emulsifiers, and acids.

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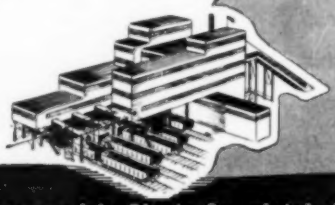

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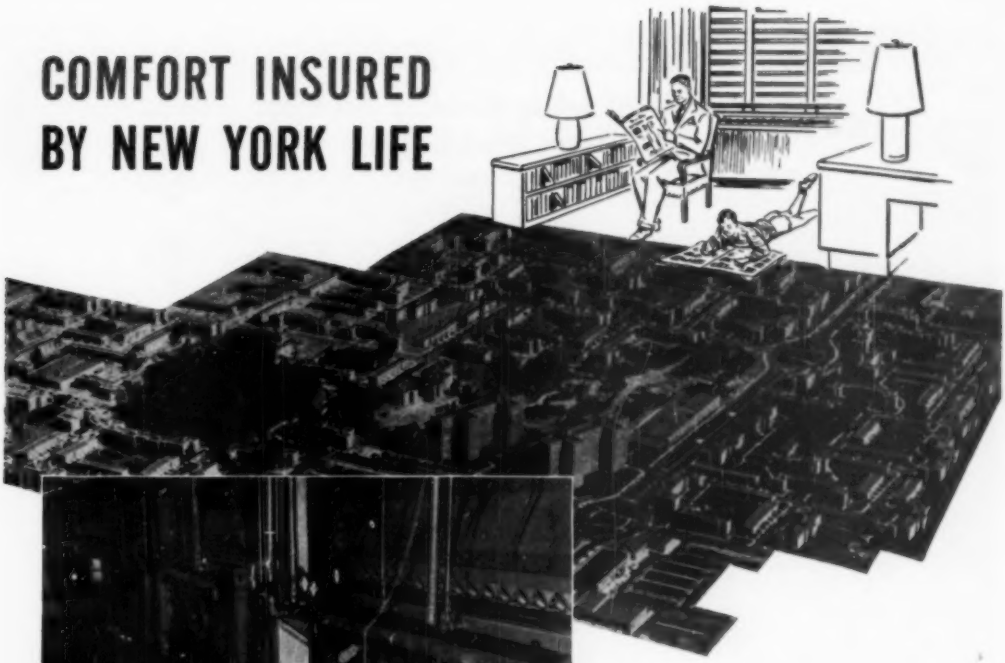

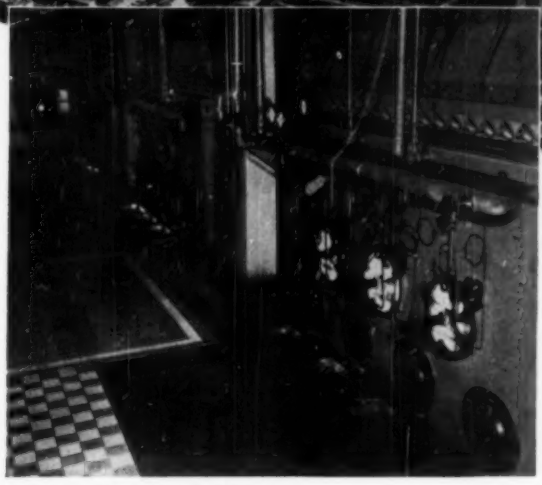

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You will benefit by the long experience of your J-M Insulation Contract firm in all phases of insulation application . . . from engineering the job to the skill of his mechanics in applying the insulations.

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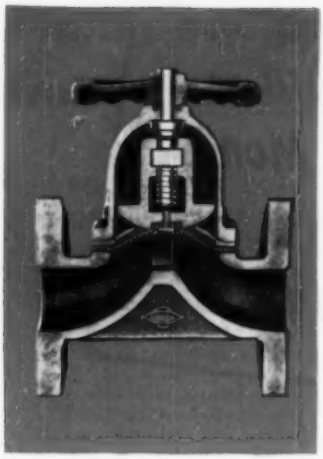

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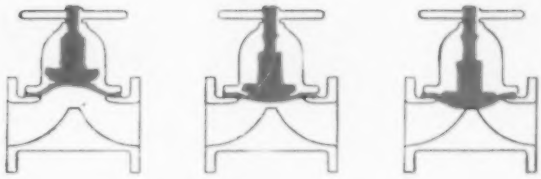

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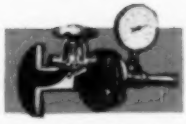

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Diaphragm absolutely isolates working parts from fluid . . . There's no "if" about the way a continuous, one-piece diaphragm seals off the working parts from fluids; no perforation or puncture in the diaphragm where fluid or gas can possibly leak by the valve spindle. No sticking, clogging or corroding of working parts. Valve lubricant cannot contaminate the fluid in the line.

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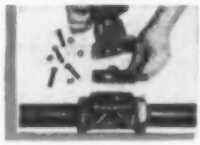
Diaphragm is only part that normally wears and needs replacement . . . Depending on the type of service, it may last for years, particularly since the compressor and finger plate combine to support the diaphragm in all positions. The diaphragm can be replaced quickly without removing valve from line. No refacing or reseating. No disc holder to require tightening or replacing. No packing glands to demand attention.



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Bailey Controllers of this type accurately measure and record the factors upon which controls are based.

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3. Gives you the same complete control, when you change fuel, or even when you burn waste.

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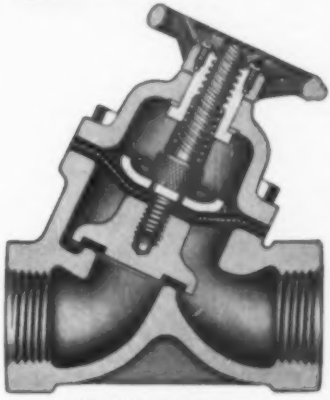

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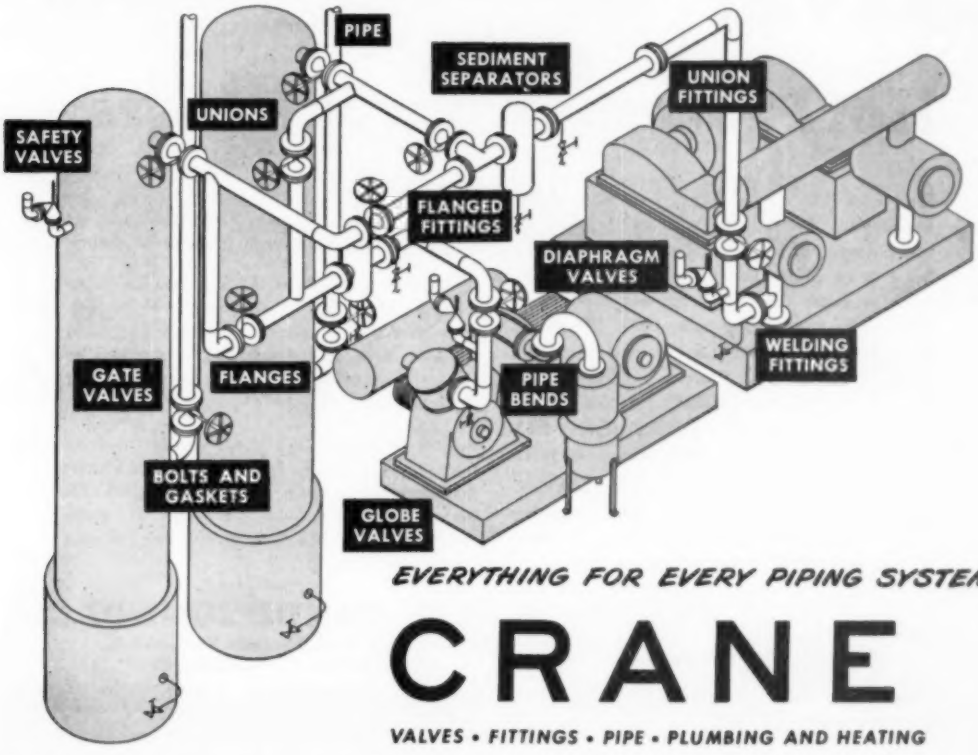

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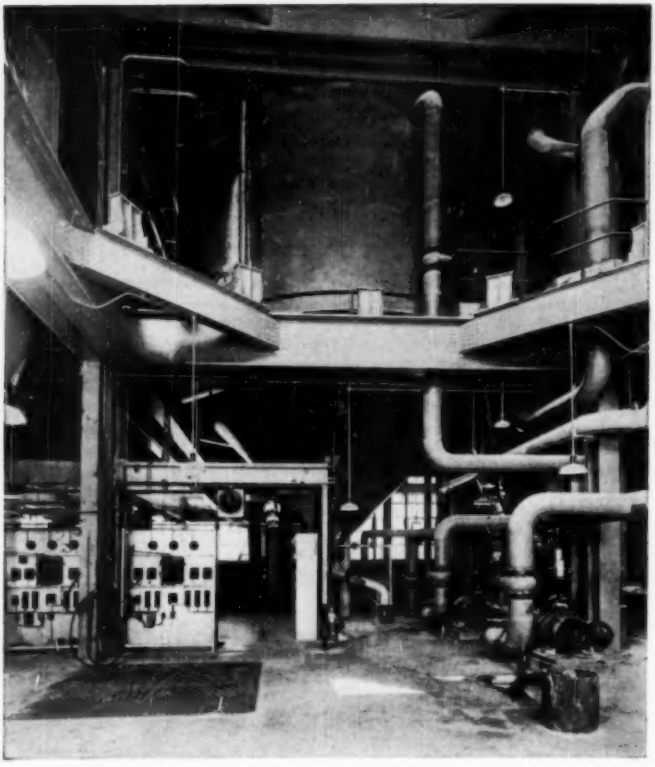
CRANE

VALVES • FITTINGS • PIPE • PLUMBING AND HEATING

One of the two 85,000 gph GRAVER Hot Process Softeners installed at Indianapolis Power & Light Co. The photograph shows the lower portion of the sedimentation tank inside the building.



"Success Story" of GRAVER

Hot Process Water Softeners

This GRAVER "Success Story" took place at the Indianapolis Power & Light Co. Five Hot Process Softeners of another make were being used, but a more efficient central installation was desired. A single GRAVER unit was installed to replace the five existing older units. When the plant was later expanded, an additional GRAVER Softener was installed. These two GRAVER Hot Process Lime Soda Softeners have a combined capacity of 170,000 gph, and are treating feed water for boilers operating at 625 psig and 750°F.

The thorough effectiveness of this GRAVER installation is shown in the following results: The raw water hardness of 290 ppm is reduced to less than 15 ppm with excess soda ash of 25 ppm and causticity of approximately 10 ppm (all as $CaCO_3$). An effluent turbidity of less than 8 ppm results in minimum filter back-washing.

And here's another GRAVER advantage to remember. All major component parts of the Softeners were fabricated in the GRAVER shops, and the units were erected and initially operated by GRAVER, providing a single responsibility for the entire job.

A new GRAVER bulletin explaining the functions, principles and applications of Hot Process Softeners and the distinctive features of GRAVER designs is now available. You will find it particularly informative and helpful. Write for your copy today.

GW 408

GRAVER WATER CONDITIONING CO.

216 West 14th Street, New York 11, New York, U.S.A.

CHICAGO • PHILADELPHIA • CLEVELAND

GRAVER

A DIVISION OF GRAVER TANK & MFG. CO. INC. EAST CHICAGO, IND.

Flexible Element Connection

another reason

why more
DIAMOND G9B SOOT BLOWERS
are in use than any other

When tube movement relative to the boiler walls exceeds the amount that can be compensated for by supporting the blower head on springs, the Flexible Element Connection is used. It will take care of such extreme cases where movements as great as 2½" are encountered.

The Diamond Flexible Element Connection makes the element freely self-adjusting for movement of the boiler tubes—it is entirely independent of the head and the outside piping. The head is rigidly bolted to the wall box while the element moves freely with the tube bank. Coupling assembly design prevents lateral shifting of the element to the point of nozzle misalignment.

Individual G9B units can be made automatic any time after installation by simply adding a drive to existing equipment. Then, all blowers on the boiler can be made automatic sequential in operation by addition of a control panel. Write for Catalog No. 1014 for further information. 3703

DIAMOND POWER SPECIALTY CORPORATION
Detroit 31, Michigan
DIAMOND SPECIALTY LIMITED • Windsor, Ontario

other advantages

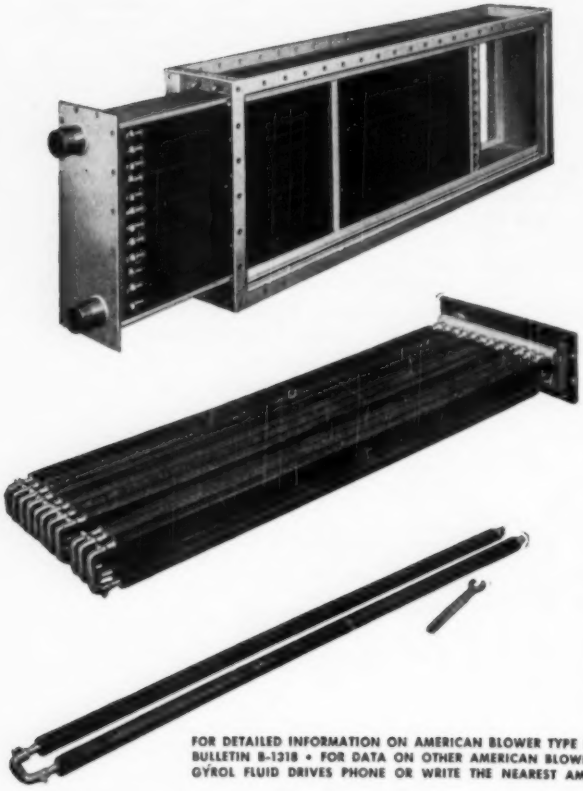
Automatic Valved Head . . . only one operation opens and closes the valve and simultaneously rotates the element.

Adjustable Pressure Control . . . easily adjusted to reduce pressure to correct blowing needs.

Poppet Type Valve . . . proved the best type of unlubricated valve for difficult conditions.

Cam and Trigger Valve Operation—Clockwise and Counterclockwise Element Rotation.

A.B.C. HEAVY DUTY STEAM COILS



AIRTIGHT CASING AND REMOVABLE HEATING ELEMENT

Entire heating element of American Blower Type H Heavy Duty Coil is removable from casing. Side rails provide sliding surface for easy removal and also protect tubes against damage.

REPLACEABLE CUPRO-NICKEL TUBES

Once removed, the heating element can be completely dismantled for inspection, maintenance or repair. Individual corrosion-resistant cupro-nickel tubes are replaceable by means of heavy duty couplings.

FOR STEAM PRESSURES UP TO 350 LBS. AND 600° F.

Type H Coils are available in a wide range of sizes for efficient application to any heating requirement. They are designed, tested and guaranteed for operation with steam pressures to 350 lbs. gauge and steam temperatures to 600°F.

FOR DETAILED INFORMATION ON AMERICAN BLOWER TYPE H HEAVY DUTY COILS, WRITE FOR BULLETIN B-1318 • FOR DATA ON OTHER AMERICAN BLOWER AIR HANDLING EQUIPMENT OR GYROL FLUID DRIVES PHONE OR WRITE THE NEAREST AMERICAN BLOWER BRANCH OFFICE

AMERICAN BLOWER CORPORATION, DETROIT 32, MICH.
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
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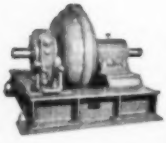
HS and Sirocco Fans for forced or induced draft in all types of power plants.

ST Fly Ash Precipitators—especially for power plants burning pulverized fuel.



Type VS Gyrol Fluid Drive—for adjustable speed control of mechanical draft fans.

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POWER PLANT EQUIPMENT

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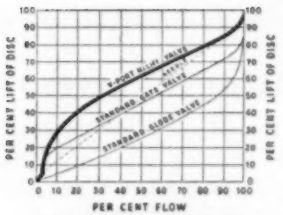

Flow characteristics of the Honeywell Hi-Lift Hand Control Valve far surpass those of conventional designs . . . offer favorable comparison to the precision of such diaphragm operated control valves as the Honeywell Series 700.

WORLD'S LARGEST ORGANIZATION FOR ADVANCED INSTRUMENTATION AND CONTROL — COMMERCIAL · RESIDENTIAL · INDUSTRIAL

THE Honeywell Hi-Lift Hand Control Valve is ideal for use where automatic regulation is not necessary or advisable. Designed to afford micrometer adjustment of flow, it contains an indicating scale to show percentage of stem travel to 1% and an inner valve capable of responding to such close correction. Inset illustration shows the simple and easy-to-read scale and the curve at left portrays the superior flow characteristics of the Hi-Lift over conventional valve designs.

The Honeywell Hi-Lift is available with v-port or parabolic discs . . . in sizes from ¼" to 12" . . . straight through or angle . . . for pressures up to 600 lbs. . . . with body of Bronze, High-Tensile Iron or Cast Steel . . . and with Bronze or Stainless Steel trim. Available, too, with electric motor for remote control applications.

Call in your local Honeywell engineer for detailed information about the Hi-Lift and such other Honeywell Process Control Specialties as: Transfer Valves, Liquid Level Devices, Cylindrical Plug Valves and the Honeywell Space-Saving Bypass.

Write, today, for a copy of Bulletin #242-1!

MINNEAPOLIS-HONEYWELL REGULATOR CO.
BELFIELD VALVE DIVISION
Philadelphia 44, Pa.

Offices in 77 principal cities of the United States, Canada and throughout the world

Honeywell — Process Control Specialties — Belfield

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For melting all non-ferrous metals — in high frequency and induction furnaces, pit furnaces, direct arc type rocking furnaces — Norton Company offers a complete line of high temperature cements and prefired shapes. **Fused magnesia cements** for lining Ajax-Northrup high frequency furnaces melting nickel-chromium alloys; **silicon carbide mixtures** for ramming into oil or gas fired reverberatory and pit furnaces melting aluminum, copper and zinc; **fused alumina cements** for lining burner tunnels in gas or oil fired billet heating, heat treating and annealing furnaces; **fused magnesia cement** for rammed linings in Ajax-Wyatt low frequency vertical ring induction furnaces melting high copper alloys, and cupro-nickel, nickel-silver and cadmium-bronze alloys.

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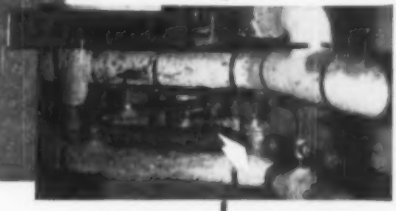
"This Steam Trap is unconditionally guaranteed to satisfy you!"

YOU CAN'T LOSE

SAVED 3728 GALLONS OF FUEL OIL in one year after replacing old traps with Armstrongs on kettles, low pressure heating system and cream beaters.—*Mary Lincoln Candies, Buffalo, New York.*



30% LESS MAINTENANCE with Armstrong traps on heating and steam distribution system.—*John Deere Harvester Works, East Moline, Ill.*

COOKING KETTLE OUTPUT SPEEDED UP 30% by Armstrong trapping on each steam jacketed kettle.—*Bulman's Ltd., Vernon, B. C.*

EVERY Armstrong steam trap is guaranteed to be free from defective workmanship or material, to function perfectly, to fulfill all claims in every respect and to give complete satisfaction.

ONLY A GOOD STEAM TRAP COULD *POSSIBLY* BE BACKEDBY SUCH A GUARANTEE! To save fuel, to reduce maintenance, to get more work out of existing equipment, to get complete steam trap satisfaction, ask your nearby Armstrong representative to discuss with you the traps you need now.

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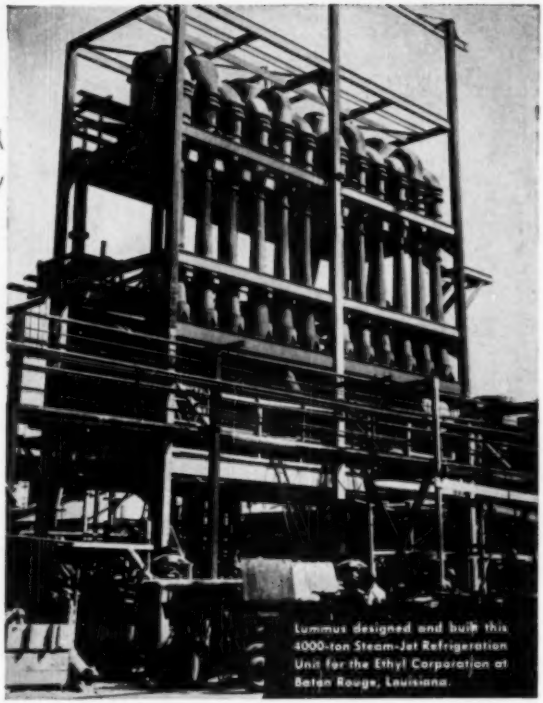
806 Maple St., Three Rivers, Mich.

SEND FOR YOUR COPY OF THE 36-PAGE ARMSTRONG STEAM TRAP BOOK explaining the design and workmanship that make the Armstrong guarantee possible. Complete data on the selection and installation of traps for all classes of equipment. Free on request.

ARMSTRONG STEAM TRAPS

WORLD'S LARGEST

steam-jet refrigeration unit



Lummus designed and built this 4000-ton Steam-Jet Refrigeration Unit for the Ethyl Corporation at Baton Rouge, Louisiana.

No similar unit as large as this 4000-ton giant had ever been operated before, but Lummus' record of achievement and heat-transfer engineering experience won the contract.

The unit provides a dependable, low-cost supply of chilled water. Like all Lummus steam-jet refrigeration units, it has these operating advantages:

- *no expensive refrigerant replacement*
- *no moving parts to replace*
- *low maintenance cost*
- *simple operation*
- *long service life*

Lummus steam-jet refrigeration units are used to chill water for air conditioning systems and for petroleum, chemical, and other industrial processes. These units operate with minimum quantities of steam and condensing water, utilizing either exhaust or live steam and do not require specially treated make-up water.

Whether your refrigerating requirement is in tens or thousands of tons, you can get a dependable, economical steam-jet unit engineered for the job by Lummus. Many standardized units are available to meet a wide range of requirements. If your problem is a special one, Lummus engineers have the knowledge and experience to help solve it.

THE LUMMUS COMPANY
Heat Exchanger Division
259 West 14th Street, New York 11, N. Y.

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Write for illustrated bulletin

We shall be glad to send you a copy of a publication containing 16 pages of design data, illustrations, and diagrams of heat transfer equipment. Ask for Bulletin M-303.

LOOK TO LUMMUS for Steam Surface Condensers • Evaporators • Feed Water Heaters • Boiler Blowdown Heat Exchangers Steam Jet Air Ejectors • Steam Jet Refrigeration • Barometric Condensers • Heat Exchangers • Process Condensers • Reboilers Steam Generators (Indirect Fired) • Fuel Oil Heaters • Lubricating Oil Coolers • Pipe Line Coolers • Jacket Water Coolers

—it's easier and better the WeldELL® way—

"Taylor Forge has thought of everything!"

A construction superintendent said it, but it has been expressed in one way or another by thousands of men who have lived and worked with Taylor Forge Welding Fittings and compared them with all other makes.

From the very start, Taylor Forge did the improving: set up a rigid, seemingly unattainable set of specifications for ideal welding fittings long before they were produced on a commercial scale.

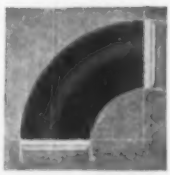
But it was easier to think of everything than to accomplish it. Only the knowledge that Taylor Forge had accumulated, only the forging skills that Taylor Forge had developed, could have produced welding fittings that please alike the men who design piping, the men who erect piping, and the men who pay the bills.

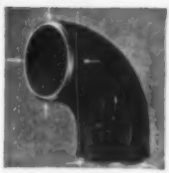
Today in the WeldELL line, you have the fittings that *ask* for comparison. Some of their plus-value features—features that are combined in no other fittings—are pointed out here. Remember that the plus-value line is also the broadest line! Coupon brings catalog.

Taylor Spiral-Weld Pipe is again promptly available in a broad range of sizes and thicknesses. Coupon brings new Spiral Pipe Bulletin 493.

1 Seamless throughout

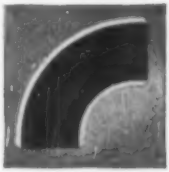
2 Sized end-tangents

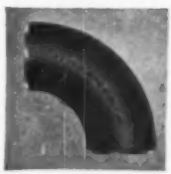




3 Precision quarter-markings

4 Engineered for full strength





5 Clear and complete identifications

6 Machine-tool bevels and lands

7 All materials: carbon and alloy steels; corrosion resistant alloys.

8 World's widest range of sizes, types, weights.

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TAYLOR FORGE & PIPE WORKS P. O. Box 485, Chicago 90, Ill. • Eastern Plant: Carnegie, Pa. • Western Plant: Fontana, Calif. • District Offices: New York, Philadelphia, Pittsburgh, Houston, Los Angeles, Chicago.

☐ Please send new Catalog 484 covering welding fittings and forged steel flanges.

☐ Send new Bulletin 493 covering Taylor Spiral-Weld Pipe and related fittings.

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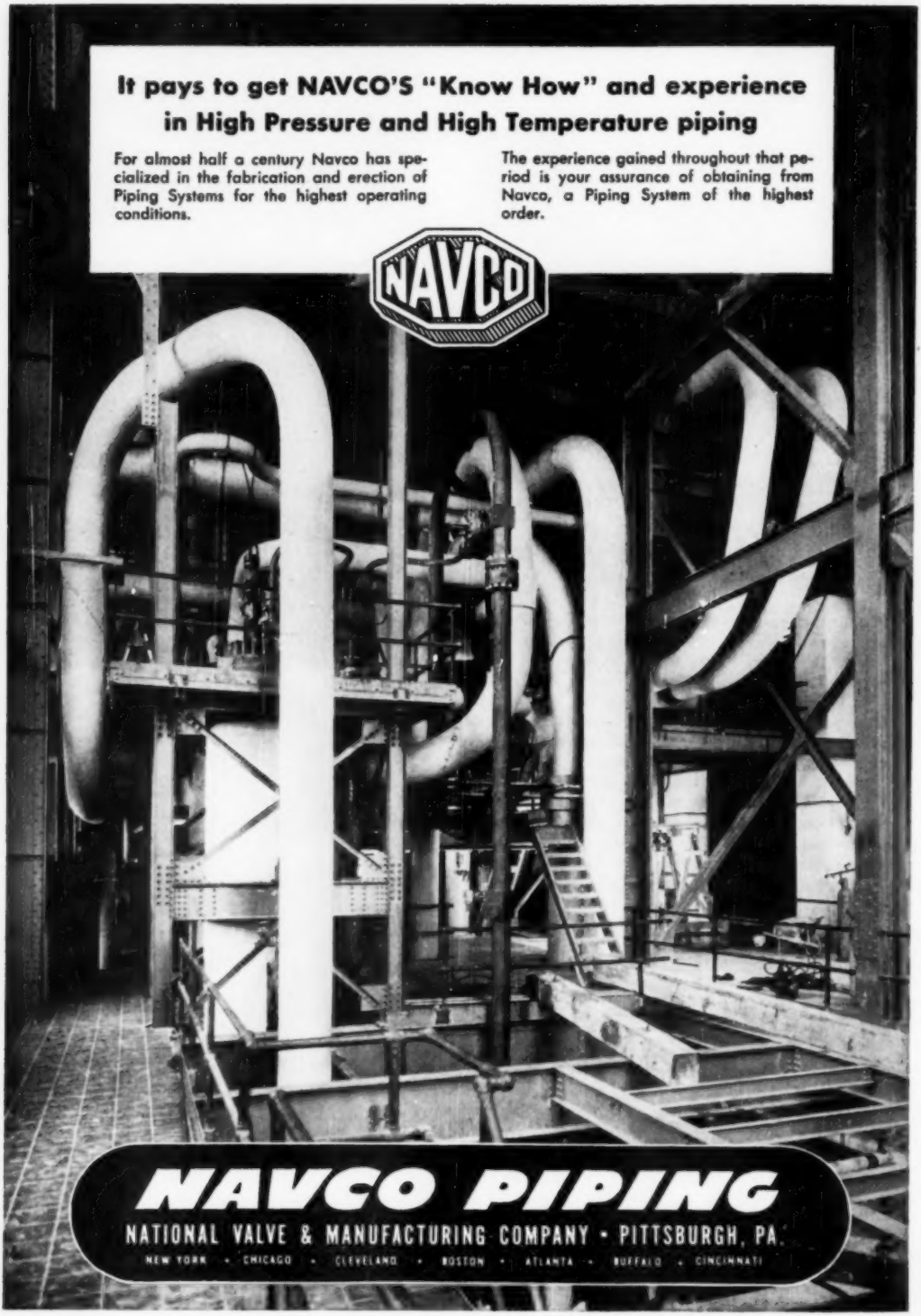
It pays to get NAVCO'S "Know How" and experience in High Pressure and High Temperature piping
For almost half a century Navco has specialized in the fabrication and erection of Piping Systems for the highest operating conditions.
The experience gained throughout that period is your assurance of obtaining from Navco, a Piping System of the highest order.
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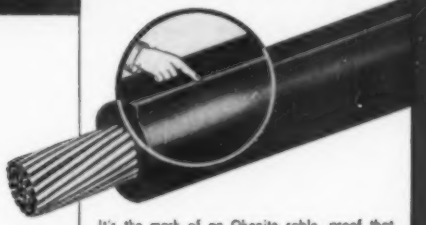
A CLUE TO LIFETIME CABLE VALUE

Look for this ridge and you find a reason . . .



It's the mark of an Okonite cable, proof that highest quality insulation has been applied to the conductor by Okonite's strip process. Still prominent after removal of the continuous metal vulcanizing mold, this ridge symbolizes many extra engineering features built-in to make sure Okonite outperforms ordinary cables . . . offers true economy in these days of high installation costs.

HERE, FOR EXAMPLE, IS A CABLE THAT'S PROTECTED 4 WAYS

It is a cable with a long and extensive service record. It is an Okolite-Okoprene cable with extra protection from conductor coating to sheath. It passes, in addition to a-c tests, high voltage d-c tests more severe than those required by any other manufacturer.

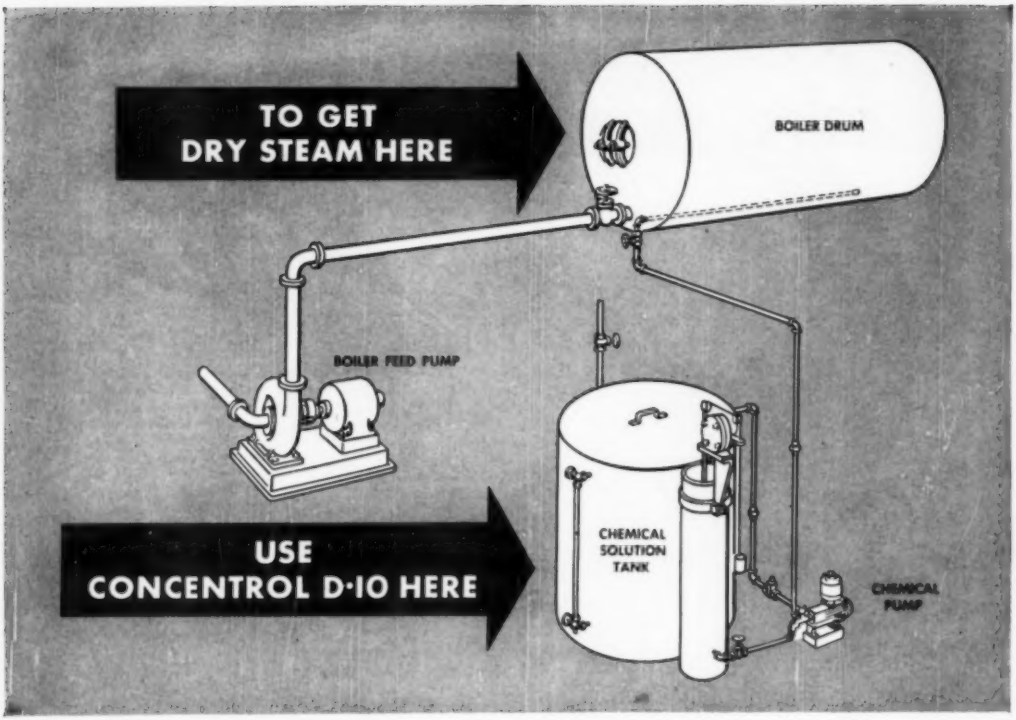
Into four different parts of this cable, extra service life is built . . . *at the conductor* (1) by a coating of Okoloy, a special corrosion-resistant lead alloy that outlasts tinning 2 to 1 . . . *about the conductor* (2) where an application of Semicon tape — on all Okolite-Okoprene cables operating at over 2000 volts — eliminates internal corona cutting and increases dielectric strength.

True cable value is added *by the insulation* (3) which is moisture-resisting, high-voltage Okolite made with Up-River Fine Para Rubber, the best grade of natural rubber. Okolite, an oil base insulation, has been proved in over 20 years of service, and is approved by Underwriters' Laboratories, Inc. as Type RWSN. *The outer sheath* (4) is Okoprene, the pioneer neoprene cable covering developed in the Okonite laboratories. Its life-extending durability and stable characteristics have been demonstrated on millions of feet of cable installed during the last 14 years.

Okolite-Okoprene cables possess many advantages from the standpoints of installation, electrical operation and design. These, along with dimensions and other data, are combined in an illustrated Bulletin SP-1037. For a copy, address The Okonite Company, Passiac, New Jersey.

THE BEST CABLE IS YOUR BEST POLICY

OKONITE SINCE 1878 *insulated wires and cables*



New Concentrol D-10 STOPS Foaming

FOAMING is one of the major causes of wet steam, an enemy of boiler performance. It may produce superheater deposits, failure of superheater tubes, deposits in steam traps and on turbine blades, damage to engine heads and many other operating difficulties. To help prevent them, Bird-Archer now offers Concentrol D-10, *a new development in foam control.*

HOW IT WORKS—This polyalkylene glycol compound sharply reduces steam bubble surface tension, thus permitting coalescence of the steam bubbles. This action eliminates carryover of boiler water due to foaming. As a result, you get dry steam.

HOW IT CONDITIONS SLUDGE — Concentrol D-10 comes in several different formulations, some of which contain a blend of selected tannins which condition boiler water sludge and suspended matter maintaining them in a fluid condition.

Concentrol D-10 is economical and can be applied continuously or by slug-feeding. It will prove effective in quantities from .05 to .2 lb. per 1,000 gallons of feedwater depending on individual conditions.

For full details on Concentrol D-10 and recommendations on your specific problem, consult your nearest Bird-Archer representative. Or write direct to Bird-Archer for further information.

BA 155

TYPICAL CONCENTROL D-10 "SUCCESS STORIES"

IN the highly alkaline waters of the Southwest, where blowdown rates approaching 25% formerly were necessary to stop foaming, the use of Concentrol D-10 has permitted non-foaming operation with boiler water alkalinities over 100 grains per gallon and concentrations of dissolved solids approaching nearly 500 grains per gal.

A mill in northern New York was forced to temporarily use a raw water of 20 grains hardness and containing 30 grains of chlorides. The use of Concentrol D-10 successfully prevented foaming with concentrations over 550 grains per gallon of dissolved solids.

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PUT YOUR COMPLETE
POWER PIPING JOB
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CAPABLE HANDS

Prefabrication is the accepted method to use on today's power piping job. And it takes capable hands to do the job—every step along the way from engineering through field erection.

Efficient prefabrication requires correct interpretation of blueprints . . . careful detailing to coordinate shop work with field work . . . complete shop facilities and trained craftsmen . . . highly specialized metallurgical control, model testing, and other accepted test procedures . . . and expert field erection.

Equally important—it requires long and diversified practical experience with all types of high pressure, high temperature piping. We have specialized in this field for almost half a century. Ask our nearest field representative for additional information.

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Free Yourself

from Constant Repair and Replacement Troubles with the

Chapman LIST 960

...the long lasting Gate Valve!

Unlike ordinary valves, the Chapman 960 is extra-sturdy to give you longer trouble-free service. And here's why —

1. Body and yoke are made of tougher forged steel.
2. A flanged, forged-steel packing gland protects threads on valve yoke from rust and corrosion.
3. No gaskets to blow.
4. Repack it under full pressure — no pressure transmitted to valve stem.
5. Newly designed stem and wedge gate connection gives 50% increase in strength at points where extreme stress can develop.
6. Malcomized stainless steel seat rings and wedge faces ensure maximum wear resistance.

So for your best buy specify the Chapman List 960. Available in sizes from ¼" to 2" — carbon steel for pressure range 2000 pounds at 100° F., 380 pounds at 1000° F. For higher pressures, specify List 990.

The Chapman Valve Manufacturing Company
INDIAN ORCHARD, MASSACHUSETTS

Timely Comments

Always Room For Leaders

IN OKLAHOMA, during the past decade, as well as in nearly all Southern and Southwestern states, communities have come to the realization that industrial growth needs encouragement and stimulation. Mr. C. A. Vose, president of The First National Bank and Trust Company of Oklahoma City notes that many citizens of that city have given their mind-power and their man-power to a program of industrial development.

Some excellent results may be indirectly attributed to their work, and the atmosphere has become more and more agreeable for the progressive growth of business and industry.

Enlightened citizens know full well that the creation of a new wealth in America, as elsewhere, comes not only from growing crops, but also, in large measure from the value which is added to raw materials when they are processed or manufactured.

Mr. Vose emphasizes, for instance, that volcanic ash is shipped to Chicago at $1 a scoop shovel. Soap is added and it is shipped back as kitchen cleanser at $100 a scoop shovel. Petroleum is sold at $2 a barrel, and is brought back as flavoring extracts, synthetics, and perfumes at $200 to $1,000 a barrel.

"Leaders in Oklahoma City and in many cities and towns in Oklahoma are investing their capital and energy in enterprises which will enrich their communities many times over. There is a place for everyone who is interested in industrial development to take advantage of the tremendous opportunities which exist. This type of confident leadership will serve the entire community, through its payrolls and its profits."

Industry College Partnership

COLLEGES should provide their students with a sound foundation of fundamentals, and industry must provide the proper environment for the graduate by using a man's abilities at the highest possible level. This new attitude toward the mutual responsibilities of industry and colleges in the training of young engineers was urged by J. C. McKeon of the Westinghouse Electric Corporation.

Industry should select recruits on the basis of potential rather than immediate productive ability, and then should provide them with the necessary orientation and basic training to do a job. On-the-job training as well as a program of job rotation, promotion, and continuing education in both technical and management problems—either by company study programs or graduate study at universities—is also necessary.

Leaders of the future will be drawn from the ranks of professionally trained men. So it is imperative that industry not only prepare engineers for key technical positions, but also develop men for management.

Balanced Management

ONE Louisville, Kentucky, executive points out that it becomes increasingly obvious how important it is that those in management positions have good technical understanding of their businesses. A manager who relies entirely on his immediate subordinates for all information of matters beneath them and accepts their judgment implicitly, is riding for a fall. He becomes a figurehead. The principles and techniques of management are obviously essential, but to be completely effective, the plant manager must also have a technical understanding of the business in all its phases.

Industry And The Press

NEWSPAPERMEN and business paper editors believe there is better cooperation between the press and industry now than was thought possible a few years ago. The editors give credit to the effort made by industry to cooperate, and to the better understanding industry now has of the editor's job. Industry has received direct benefits from this understanding. Even better relations between the press and industry are expected for the future.

POWERS

NO. 11 TEMPERATURE REGULATOR—*Controls Temperatures of Liquids or Air*

4 PLUS VALUES

1. OVER-heat Protection
2. Valve Stem Lubricator
3. Temperature Adjustment has OILITE Thrust Bearing
4. Indicating Regulator Available *

Simple, Self-Operated, Economical—Dependable

Give

BETTER TEMPERATURE CONTROL

and Extra Years of Dependable Service

OFTEN PAYS BACK ITS COST SEVERAL TIMES EACH YEAR

When you want a simple dependable control to maintain a constant uniform temperature install a Powers No. 11 Regulator.

PREVENTS OVER-HEATING—SAVES FUEL and LABOR

HELPS INSURE A UNIFORM PRODUCT • MANY GIVE 10 to 25 YEARS OF SERVICE

For valuable aid in selecting the proper type and size of regulator take advantage of our 59 years of experience. Contact our nearest office or write to • THE POWERS REGULATOR CO., 2756 Greenview Ave., Chicago 14, Ill. • 231 E. 46th St., New York 17, N. Y. • 1808 W. Eighth St., Los Angeles 5, Cal. • 195 Spadina Ave., Toronto, Ont.

WRITE FOR BULLETIN No. 329

THE POWERS REGULATOR CO.
142 Spring St. N.W., Atlanta 3, Ga.

Gentlemen: Please send me Bulletin 329. Am interested in control for .....

Name ..... Title .....

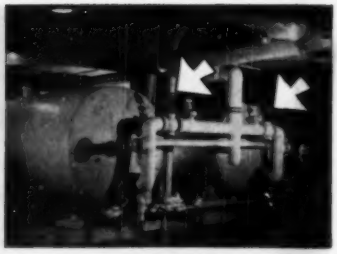
Firm Name .....

Address .....

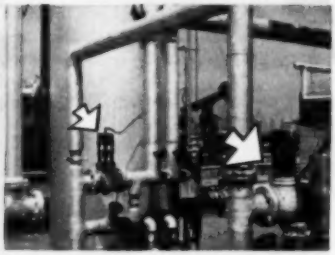
A-11

NO. 11 INDICATING REGULATOR

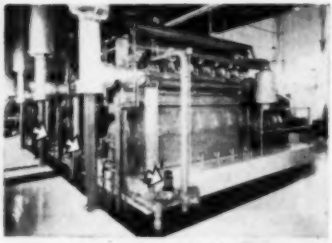
Has 4" Thermometer dial mounted on top of regulator. Both thermometer and bulb operate from same thermal system. Only one tapped opening required. Gives visual check on performance of regulator. Makes it easy to adjust for the right temperature.



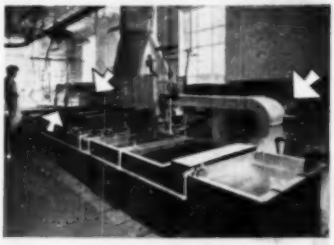
For WATER HEATERS and HEAT EXCHANGERS



For OIL HEATERS and TREATERS



For JACKET WATER COOLING IN DIESEL and GAS ENGINES



For METAL PLATING above below COOKING VATS

Industry Speaks

How Can We Pay the Bill?

If we cannot meet the expenses of Government in a year as prosperous as 1949, and if the President and Congress are constantly increasing Government costs by making additional appropriations, how can we ever hope to pay the bill?

By FRANK P. SAMFORD

President
Alabama State Chamber of Commerce

Speaking before the annual meeting of the Alabama State Chamber of Commerce, said in part:

DEFICIT financing by Government is a serious thing and should never be condoned except in time of war. Whenever the Government spends more than it takes in, it simply creates the additional money which is pumped into our economy and has the effect of reducing the value of every dollar that is already in existence.

No Policy Defense

You saw it happen during the war—you saw prices climb, which simply meant that the dollar was not worth as much as it had been. We all talked about inflation and worried about inflation, and we certainly did have a degree of inflation. That was serious, but if we considered it as temporary, to be stopped when the war ended, it might be justified. There can be no defense of a policy that creates additional money through deficit financing in prosperous peacetime years.

No Money Of Its Own

The Government has no money of its own; it can give money to people only after it has first taken that money from people, either through taxation or by inflating the currency: the organization to collect the money from the people costs money, and the organizatzion to give the money back to the people costs money, so the people always get back less than they pay.

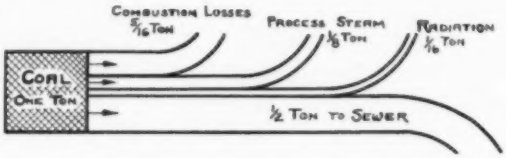
How long will people continue to believe that the Federal Government has unlimited wealth that can be distributed without ultimately destroying our Democracy? It may be too late—so many people have already become so accustomed to looking to Government for financial assistance and for subsidies that they vote for those who promise to continue or increase these gifts.

If it is not too late, it will take the best effort of every enlightened citizen to convince the average voter that the "Primrose Path" that promises to lead to a welfare state where all are financially secure regardless of their contribution to the production of the nation and to society eventually leads to a lower standard of living for everyone and to the loss of all freedom.

Unless we can elect to the Congress, men with the courage to cut appropriations and expenditures, men with the courage to quit giving away money and continuing subsidies, men with the courage to face the issues squarely and balance the budget, there seems to be little hope that our Democratic form of Government will endure and that future generations in America will enjoy the freedom we have known.

How Heat Exchangers Pay Off

Applications, Case Studies, and Calculations



In plants where heating process water constitutes most of the heat load, Btu losses to the sewer may be as high as shown above.

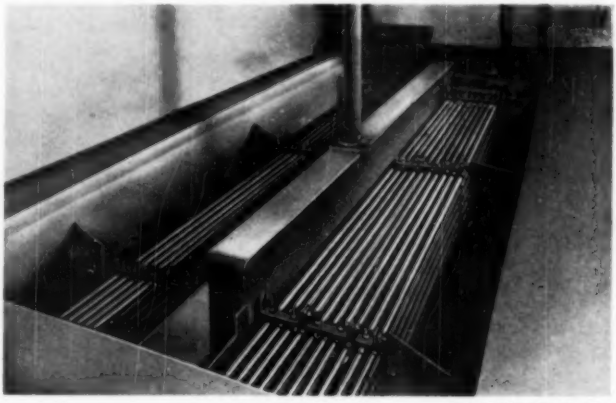
IF the plant engineer were to make a report to the management at the end of every third shift stating that during the 24 hour period he had ordered the fireman to shovel ten tons of coal into the ash dump, the plant would soon have a new engineer. An equivalent waste is taking place every day in many otherwise well run plants, and the engineer is unable to stop it because the management either does not understand the loss or refuses to invest the money for the purchase and installation of equipment designed to recover the wasted heat.

Too much heat in the form of hot water is being flushed into the sewer. The heat in ten gallons of water at 160 F wasted into the sewer represents just about one pound of coal or three-fourths of a pint of fuel oil. Measure the gallons of hot water being thrown out every day, and it is a simple matter to estimate the pounds of coal or the gallons of oil being wasted. A plant running 10 million gallons of water through its washers in a month may be wasting a million pounds, or 500 tons, of coal during the period At today's prices this is hardly a pleasant thought, and yet it is a general practice in many industrial plants.

Recovery of Waste Heat

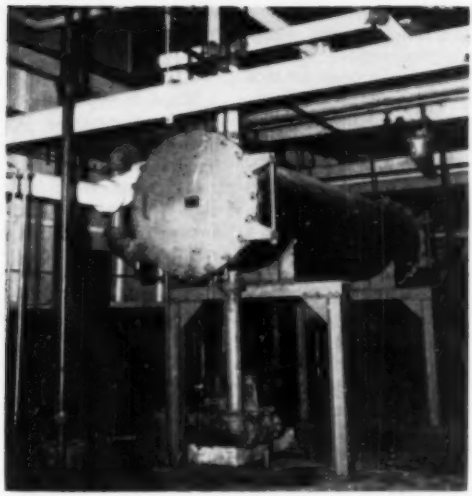
It is impossible to recover all of the heat in waste water. The ideal condition would be to have the waste water leave the plant at the same temperature that the fresh water enters—all heat from the waste water being recovered in heat exchangers and returned to the plant.

A heat exchanger built to achieve say within 5% of this ideal in operation however would be a large and expensive affair. It would cost so much that the savings, high as they would be, would never return the original investment and cover maintenance cost. Here, as in all things mechanical, there must be a compromise. It is reasonably easy to take waste water at about 190 F and transfer heat from it to the same volume of incoming fresh water at 50 F so that the fresh water gains 110 F from the waste. This would mean that the waste to the sewer would have a temperature of 80 F instead of 190 F, and the fresh water going to the plant would be at 160 F instead of 50 F. (Figs. 6 & 7). The temperatures of the fresh water leaving the heat exchangers can actually be brought even closer to the temperature of hot waste water entering the exchanger but the closer these two temperatures are



Whitlock Manufacturing Co.

FIG. 1. AN OPEN TYPE PREHEATER INSTALLED IN A PIT BELOW FLOOR LEVEL.



P. O. Sims Co.

FIG. 2. A SHELL AND TUBE TYPE HEAT EXCHANGER IN A LARGE ALABAMA FINISHING MILL.

brought together, the larger and more expensive must be the heat exchangers. The most economical compromise must be individually determined for the particular temperature and volume conditions of the plant. A minimum difference of about 30 F between the waste water on one side of the exchanger tubes and fresh water on the other side is considered normal good practice for hot to cold water heat exchangers, but a substantially lower difference is economically justified in many cases. This minimum difference in temperature is generally called the approach interval.

Heat Exchangers

A heat exchanger is by definition any device by which heat may be transferred from one fluid to another through a separating wall. Thus, boilers, condensers, closed heaters, evaporators, and many other pieces of industrial equipment may be classified as heat exchangers. But, we are dealing here with heat exchangers designed to heat fresh incoming water with hot contaminated water.

There are two generally acceptable methods of recovering waste heat from waste water, one commonly known as the open or pit type, the other known as the closed or shell and tube type heat exchanger.

Open Type

The open type consists of a tubular heat exchanger which operates submerged in a pit through which the hot contaminated water flows by gravity. The pit is baffled so that the waste water flows in the opposite direction to the fresh water to maintain a maximum difference in temperature between the two streams at every point. Tubes in the exchanger are spaced relatively far apart, with ample cleaning lanes. If the waste water is highly contaminated with solids, a settling and/or skimming chamber may be advisable in the waste water lines before entering the exchanger pit.

The open type exchanger is advantageous when the movement of fresh water into the plant does not coincide with discharges of hot waste water, because the volume of waste water stored in the pit is relatively large, and this storage of heat is available to heat fresh water any time it is moved into the plant. The installation can be made either indoors or outdoors. No pumping equipment is ordinarily required, and maintenance throughout the life of the equipment is limited to periodic cleaning of the pit and exterior of the tubes, which is usually accomplished with a fire hose.

Closed Type

The closed or shell and tube type of heat exchanger is much more compact than the pit type and requires less heat transfer surface. It should normally be used, however, only in cases where the movement of fresh water into the plant coincides closely with the discharge of hot waste water through the exchanger. It can also be used when the flows do not coincide, but careful planning is necessary in regard to the storage of both fresh and waste water so that both streams are circulated through the exchanger at the same time and at rates approaching the average hourly flow rates. The point should be kept in mind that you cannot heat the cold fresh water unless you simultaneously pass an ample supply of hot water through the exchanger; neither can you take advantage of the heat in the hot waste water unless you pass an ample supply of cold fresh water through the exchanger at the same time.

Pumping or circulating equipment is frequently necessary to take even reasonably full advantage of the heat contained in the waste water. Reduction in heat transfer surface is accomplished by forcing the waste water through the tubes at high velocities. This may involve passing the waste water from one end of the exchanger to the other several times, through separate passes, to obtain the required velocity. This, in turn, involves a pressure loss which must be investigated in determining whether or not to resort to pumping the waste water.

Temperature Difference

The difference in inlet temperature of the hot waste and the cold fresh water is important (Fig. 6). The greater this difference, the greater the possible savings with heat recovery equipment. Then too, the closer the *approach interval** (Figs. 7, 8, & 9), the more the savings (See Case 2 which will follow). But in order to reduce the approach interval, a heat exchanger of greater capacity must be pro-

vided. Therefore, higher capital cost tends to offset advantages of greater savings in heat.

*Note: "Approach interval" is a term coined to denote the difference in temperature between the preheated fresh water leaving the exchanger and the hot waste water entering the exchanger. Obviously this is one of the most important guiding factors in determining the size of exchangers for plants in which the demand rate for fresh water is equal to, or less than, the discharge rate of hot waste water. Applying this term to the high temperature end of the exchanger constitutes the most objective use of the term, as the object of installing a heat exchanger is to raise the fresh water temperature as high as economically possible with the waste heat available, in order to recover as much heat as possible from the waste water. It is equally true, however, that in plants where the demand rate for fresh water exceeds the discharge rate of usable waste water, the emphasis on the "approach interval" in so far as sizing of the exchanger is concerned, shifts to the low temperature end of the exchanger. (Fig. 8, Case 2).

Tube Material

Another important factor to be considered is the material from which exchanger tubes are constructed. The better the material conducts heat, the better it will be as an exchanger tube, providing it will stand up to the job. Copper is the standard tube material where neither the fresh water nor the waste water is corrosive to that metal at the temperatures involved. In some plants the waste water may be extremely caustic, and this reacts with copper to destroy the tubes in a relatively short time. Under these conditions, stainless steel has been adopted as a better tube material in spite of its poorer heat transfer characteristics and its higher first cost. It is also claimed by some engineers that stainless steel has a lower fouling factor than copper. Available data from plants using heat exchangers with highly caustic waste water, indicates that stainless steel is more economical in the long run for this type of condition. However, copper is sometimes used even with caustic waters where there is other waste of an acid nature to help neutralize the high pH. Copper would normally be used where conditions permit.

Application

When it comes to the point of actual selection and application of heat exchangers several factors are important:

(1) There must be an appreciable difference in temperature between hot waste water and incoming fresh water.

(2) There must be an economic need for adding heat to the incoming fresh water. For example, if there is enough exhaust steam to produce all the hot water required, there is no economic advantage in recovering heat from waste water and throwing the exhaust steam away.

(3) The movement of cold water into the plant must coincide reasonably well with the discharge of hot waste. A heat exchanger could not help in a plant where

FIG. 3. TUBES OF AN OPEN TYPE EXCHANGER ARE WASHED CLEAN WITH HOT WATER FROM A FIRE NOZZLE.

Patterson Kelley Co.

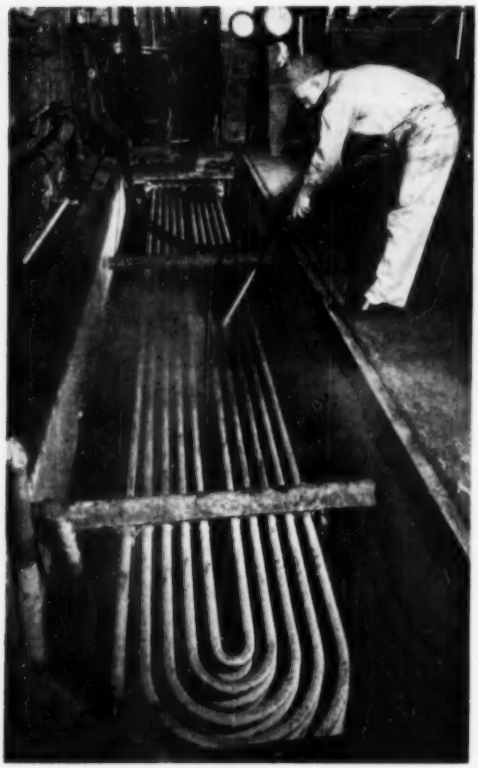
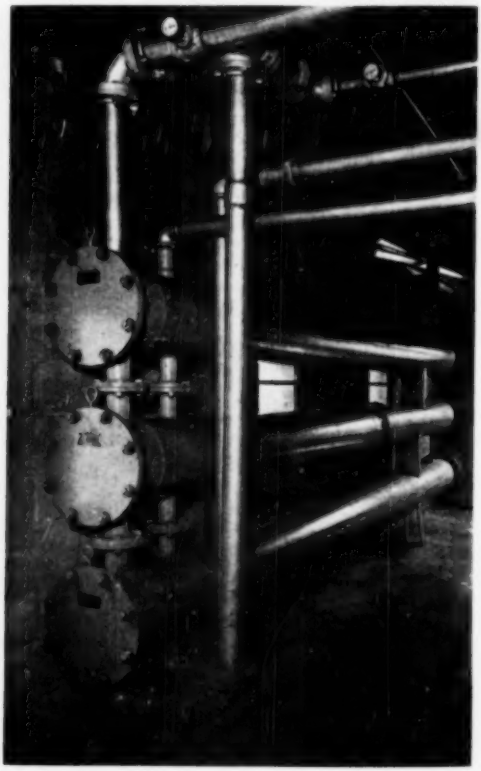


FIG. 4. THIS THREE UNIT CLOSED TYPE HEAT RECLAIMER IS USED TO IMPROVE HEAT ECONOMY IN A LAUNDRY.

Patterson Kelley Co.



cold water is taken in only in the morning and hot waste is discharged only in the afternoon. Thus plotting of flow curves to determine heat exchanger use factor may be important.

Normally it is easy to determine from an estimated heat balance, along with a few other considerations, the economic advantage of a heat exchanger.

Case 1

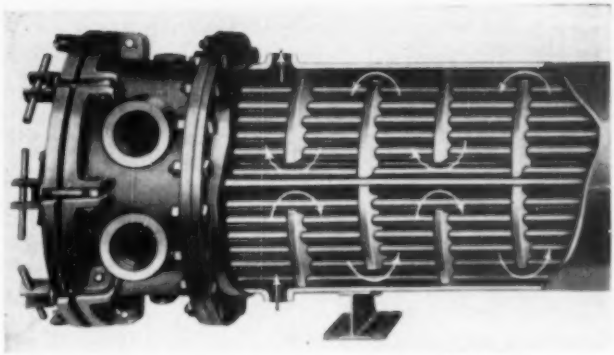
An ideal heat exchanger application is in a processing plant where waste water and fresh water are equal in volume and the flow curves are matched.

For example assume a processing plant uses 300,000 gal of hot water in the washers every day. Fresh water enters the heaters at a temperature of 50 F. It is heated to 195 F and enters the washers at that temperature. The overflow from the washers runs through piping into the sewer at 190 F. In this example, the waste water is 140 F warmer than the fresh, so we may say that the heat represented by this 140 F is simply being thrown away. For every gallon of water this amounts to 1,163 Btu. For 300,000 gal per day, this is a loss of 350,000,000 Btu, or roughly 17 tons of coal.

A theoretically perfect heat exchanger could recover all of this heat, but actually it would be economical to reclaim perhaps 75%. This lesser amount might represent a saving of over twelve tons of coal. This example is shown in Fig. 7, using an approach interval of 30 F, and with the waste water and fresh water equal in volume.

Case 2

With temperatures the same as in Case 1, assume that the incoming fresh water is twice as great as the waste volume. Obviously, here, the fresh water cannot be heated to 160 F, because there is not enough heat (Btu) available in the waste. Taking the same 30 degree approach interval, the waste discharge temperature would be 80 F as in Case 1. The recovery would also be the same (110 Btu per lb of waste). Then, since there are 2 pounds of fresh water to each pound of waste, the fresh water would absorb $110 \div 2 = 55$ Btu per pound, and its temperature would rise 55 degrees. So the fresh water temperature would be raised to $50 + 55 = 105$ degrees.



P. O. Ross Co.

FIG. 5. CUTAWAY ILLUSTRATION OF SHELL AND TUBE HEAT EXCHANGER SHOWING INTERNAL CONSTRUCTION. ARROWS SHOW HOW BAFFLES DIRECT FLOW OF FLUID ACROSS TUBES.

But because of the higher relative volume of fresh water, it would likely prove economical to use a slightly smaller approach interval (say 20 degrees) and reduce the waste to a lower temperature than in Case 1—say 70 F instead of 80 F. Then the fresh water could be heated to 110 F instead of 105 F, and the heat recovery would be raised to 120 Btu. (See Fig. 8).

Case 3

Look at another example just opposite to Case 2. This time the waste volume is twice as great as the fresh water intake. Here we have more Btu available in the waste than can be absorbed in the relatively small volume of fresh water. For no matter how many Btu are available in the waste, the temperature of the fresh water can never be brought higher than the temperature of the hot waste. So the waste will have to go to the sewer at a fairly high temperature. In order to use all the heat possible it would be desirable to heat the fresh water to the highest economical limit, which, let us assume is 20 F below the hot waste temperature or 170 F. The heat recovered would be only 60 Btu per pound of waste. (See Fig. 9).

While the examples covered by the above case studies are based on fairly high waste water temperatures, economical installations are possible with waste water inlet temperatures as low as 100 to 120 F. But naturally, in such cases, the fuel savings are much less than in the examples cited.

Other Considerations

There are other considerations. Most important is the location of the exchanger with reference to the water supply inlet and the waste overflow. For some installations, there should be no need for pumps on either end. If the fresh water is under sufficient head, no pump will be needed at that end. If the exchangers are located sufficiently below the washer room, flow from the washers can be by gravity. It is very necessary, however, to have the correct velocities for proper heat transfer. Pumping can control these velocities and may result in a more efficient exchanger.

It has already been mentioned that heat recovery equipment is more easily adapted to continuous matching flows of hot waste and cold fresh water than where variations in flow fail to coincide. While systems may be designed for batch flow of water, the savings are not so great, and the installation is more expensive. Also the addition of large storage capacity to compensate for non-matching flows can be expensive. An occasional fluctuation in quantity is not too important, but severe ups and downs reduce the effectiveness of the system. Pit type exchangers are likely to perform

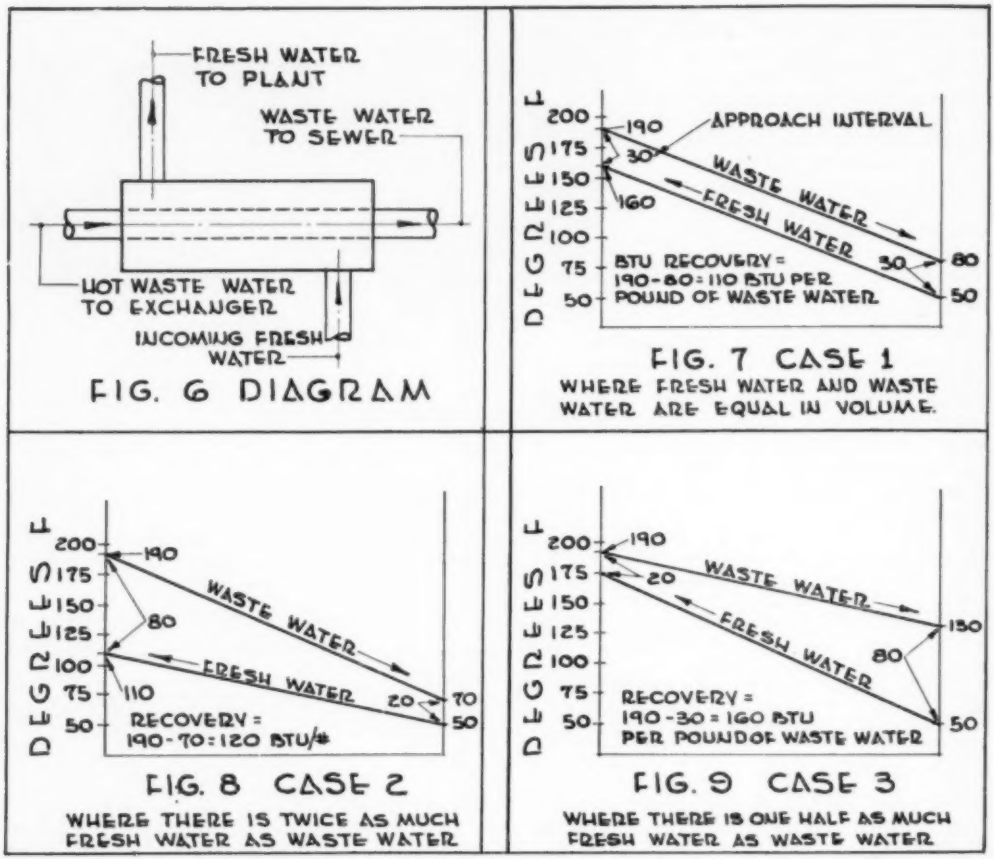


FIG. 6-9. THESE DIAGRAMS MERELY INDICATE THE GENERAL PRINCIPLES OF EXCHANGER OPERATION AND ARE NOT INTENDED TO REPRESENT ACTUAL CONDITIONS. WHILE THE END POINTS ARE ACCURATE, AN ACTUAL DIAGRAM OF HEAT FLOW IN A MULTI-PASS EXCHANGER WOULD BE SOMEWHAT MORE COMPLICATED.

better than shell and tube exchangers with intermittent flow because they normally store more hot waste water.

The plant engineer will recognize that the figures presented here, while theoretically correct, are not complete enough for actual selection of exchanger sizes and designs. A most important element is capital cost, and cooperation of the exchanger manufacturer's engineers is essential. They will help the plant engineer to make an economical choice of design and size to best fit his specific needs. The best final answer will always be a compromise based on capital cost and extent of recovery: a larger approach interval will give lower capital cost and lower recovery, while a smaller approach interval will give greater recovery at higher capital cost. The best answer is reached through experience and good judgment.

Savings

Savings made by heat exchangers may be estimated with reasonable accuracy, as will presently be shown. From these savings must be deducted the depreciation of the equipment, based on its first cost and expected life; the cost of any additional pumping done; and the cost of maintenance. Maintenance cost should be very low. Tube replacement cost is very low if materials are correctly selected to hold corrosion to a minimum under the actual water conditions encountered, and the periodic cleaning required is not an expensive item. It is only necessary to flush the tubes about once a week with hot, fresh water, a relatively simple job. On some applications, with cleaner waste, flushing is required only once every four or five months.

To estimate the gross savings in dollars per day that can be made by installing a heat recovery system, it is necessary to know or assume the cost of fuel, the heating value of the fuel, the boiler efficiency, the gallons and temperature of fresh water per day, and the gallons and temperature of waste water per day.

The cost of fuel is readily ascertained from the purchasing de-

partment, and it is likely that they will also know the specified heating value of the fuel. It is safe to say that this will be between 12,500 and 15,000 Btu per lb for coal.

While most plants operating their own boilers have at some time run boiler efficiency tests, this figure may or may not be readily available. Most medium size industrial boilers operate at 70% to 80% efficiency. An assumption of 75% is conservative for estimating savings resulting from a heat recovery system.

The gallons of both fresh and waste water per day must be known with reasonable accuracy.

It is wise to take the total over a period of a month and divide this figure by the number of operating days to get a good average figure. However, peak conditions and fluctuations in flow must also be considered in designing the equipment.

The temperature of the hot waste water may be readily ascertained with a thermometer, preferably a recording type to get a true average. The temperature of the incoming fresh water will not vary much except with seasonal changes and may be read with an ordinary thermometer.

The design temperature rise of fresh water may be computed, knowing the Btu available in the waste and knowing the quantity of fresh water, if an approach interval is assumed (See Cases 1, 2, & 3).

Having this data it is possible to find the expected performance of a heat exchanger from one of the following formulas (See Example and Calculations).

Coal Fired Plants

$$\$ \text{ per day} = \frac{8.33 \text{ PCD}}{2000 \text{ VE}} = \frac{\text{PCD}}{240 \text{ VE}}$$

Oil Fired Plants

$$\$ \text{ per day} = \frac{8.33 \text{ PCD}}{42 \text{ VE}} = \frac{\text{PCD}}{5.05 \text{ VE}}$$

In these formulas, **C** is the fresh water per day in gallons, **P** is the price of coal per ton or oil per barrel, **V** is the heating value of the fuel in Btu per pound of coal or per gallon of oil, **D** is the temperature rise of the fresh water through the exchanger, and **E** is the boiler efficiency expressed decimally. The constant, 8.33, is the number of pounds of water in a gallon, and the other constant in each formula is the pounds in a ton of coal or the gallons in a barrel of oil.

Conclusions

Heat exchangers do not replace water heaters, they are used in conjunction with them to lighten the heater's load and thereby save on the amount of fuel used. Neither do they normally replace boilers, for it is usually still necessary to have enough boiler capacity to start up and keep the cycle going so that the exchangers can function. Exchangers do, however, tend to reduce the required capacity in both heaters and boilers as well as improve over-all economy. Any plant using a sizeable quantity of hot water should study the possible savings which may be brought about by the installation of heat recovery equipment.

Acknowledgments:

The editors wish to express appreciation to the many manufacturers and users of heat exchangers that furnished data and checked copy for this presentation.

Example and Calculations

The savings in dollars per day that will result from an installation of heat exchangers may be calculated for either coal or oil fired installations from the equations presented in the article. Here is an example of the calculations for a coal fired plant.

Formula

$$\text{Savings, \$ per day} = \frac{8.33 \text{ PCD}}{2000 \text{ VE}} = \frac{\text{PCD}}{240 \text{ VE}}$$

where:

- 8.33 = pounds of water per gal
- P = price of coal $/ton
- C = gas fresh water heated per day
- D = deg F rise of fresh water
- 2000 = pounds in a ton
- V = Btu of coal per pound
- E = boiler efficiency

Example:

300,000 gal of fresh water is heated each day and 150,000 gal of waste water goes to the sewer at 190 F. Assume that heat will be used from the waste water to reduce its temperature to 70 F or 20 degrees above the fresh water inlet which is 50 F, so each pound of water will give up 190 — 70 = 120 Btu. Since there are 300,000 ÷ 150,000 = 2 pounds of fresh water for each pound of waste, each pound of fresh water will absorb 120 ÷ 2 = 60 Btu and its temperature rise (D) will be 60 degrees. Thus, the fresh water will be heated to 50 + 60 = 110 F. The results of this calculation are diagramatically illustrated in Fig. 8.

In this case D = 110 — 50 = 60.

Then taking 14,000 Btu coal cost at $5.00 per ton and, boiler efficiency at .75, we can substitute in the formula.

$$\frac{5 \times 300{,}000 \times 60}{240 \times 14{,}000 \times .75} = \$35.75 \text{ per day.}$$

Application of Over Fire Air Systems in Smoke Control

By Edward T. Douglass, Jr.
President, Douglass-Murray Company
Birmingham, Alabama

THE City of Birmingham, as is the case of so many other industrial cities, lies in a valley. When atmospheric conditions are just right, a smog condition is created which forcefully reminds every citizen that "something should be done about that smoke." Consequently, the continued agitation has borne some fruit, and to date an excellent job of smoke control has been done in this district. Mr. T. W. Langford, our Chief Smoke inspector, has worked on many varied problems, solutions for some of which are outlined here.

Fuels Used

Among the fuels used in this district there are two main offenders so far as smoke is concerned. These are soft coal and wood. The City of Birmingham lies between two fields of high volatile bituminous coal, and there is no hard or low volatile smokeless coal within the state. This of necessity limits the available coal in this community to the high volatile variety, as it would take the militia to force people to use a more expensive foreign fuel. Our other offender is the wood burning plant, which, if left unattended will belch forth tremendous columns of cindery, black smoke.

Therefore, it has been necessary to face conditions as they exist, and devise means of satisfactorily burning these fuels with as little smoke as possible.

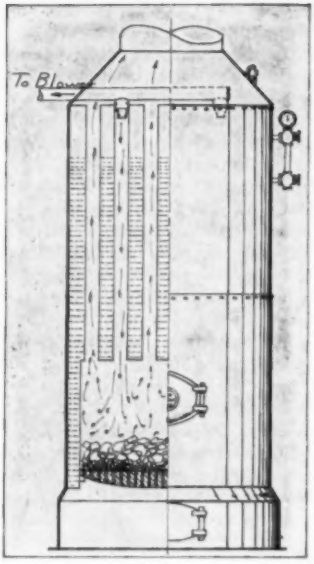


FIG. 1.

FIG. 2.

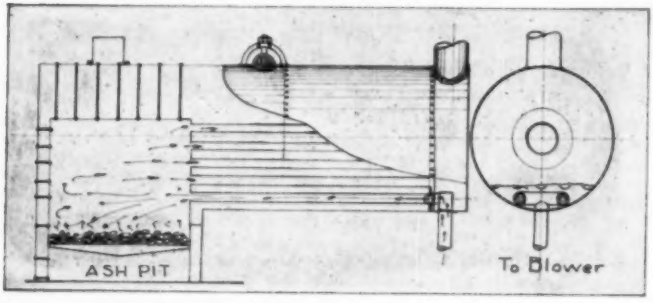
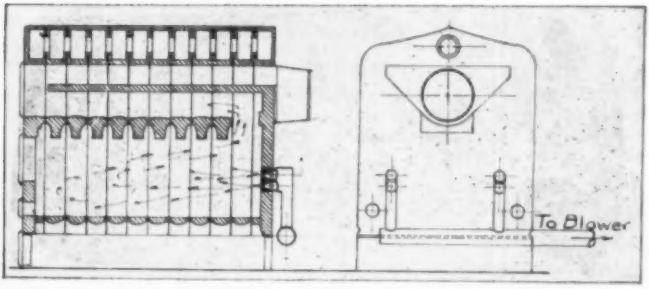


FIG. 3.



Example 1

First, we shall consider the upright fire tube boiler. This type boiler has short tubes, small grate area, little draft loss, and is a quick offender when soft coal is shoveled into the fire box. Our method of dealing with this is illustrated in Figure 1. A fan of moderate capacity is simply discharged down three or four of the boiler tubes, liberating auxiliary air directly on top of the fuel bed. This air is of sufficient velocity to penetrate the up-draft and supply oxygen directly where the gases are given off.

Any capacity loss due to the captive tubes is more than made up by the more rapid and complete burning of the fuel gases.

Example 2

The same general method outlined in example one may also be adapted to the horizontal locomotive type boiler by capturing three or four lower tubes. This procedure is outlined in example two.

Example 3

Figure 3 illustrates the use of auxiliary air in a standard American Radiator cast iron low pressure boiler. Here the two rear passage openings are used to house twin nozzles, admitting air into the fire box counterflow to the draft. This has proven very effective in eliminating smoke and is inexpensive to install.

Example 4

Figure 4 depicts the Kewanee Type "C" or the Pacific Boiler, underfeed stoker fired. The usual reason for supplying auxiliary air in this case is an overloaded condition where sufficient coal cannot be burned to satisfy the load demand. An estimated increase in capacity of approximately twenty per cent can be obtained by the use of this system with a reasonably free-burning coal.

Example 5

Another cast iron boiler installation is illustrated in Figure 5. This involves the use of a boiler with a smokeless arch just beyond the grate area. The effectiveness of the installation is only moderate, but the cost is small and in some cases it proves helpful. The writer has devised an inexpensive automatic time delay motor starter for this installation. The device consists of an undersized automatic reset thermal overload element installed in a magnetic motor starter operated with an independent push button station. As the firing door is opened, the push button makes contact and starts the fan motor. The motor continues to run until the thermal overload element, due to the use of undersized heaters, trips out and stops the fan. The fan remains off until the door is opened for firing again, at which time the switch is reset and the fan starts again.

Example 6

Now for the wood-burning jobs. In most wood burners encountered, we find the waste sawdust and shavings conveyed directly to the boiler or to a storage bin. The decision as to where, when, and how much fuel to feed the boiler usually rests with some attendant who has little interest in the smoke conditions, unless the Smoke Inspector is visiting the plant. An uneven "slugging" type of firing can produce a very smoky condition, unless auxiliary air is introduced in the furnace.

We have devised an almost fool proof remedy for this trouble without retarding the steaming qualities of the boiler. Figure 6 illustrates the installation in a HRT boiler. As is evident, a sub-bridge wall is constructed in the rear of the regular bridge wall and a header with correctly designed nozzles is inserted. Auxiliary air is delivered under pressure in a stream which mixes with the gases from the fire box directly above

(*Continued on page 77*)

FIG. 4.

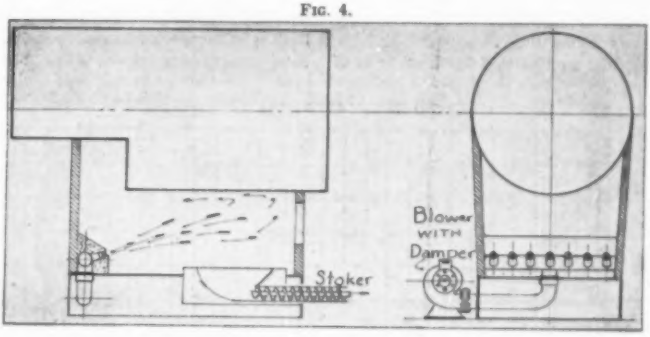


FIG. 5.

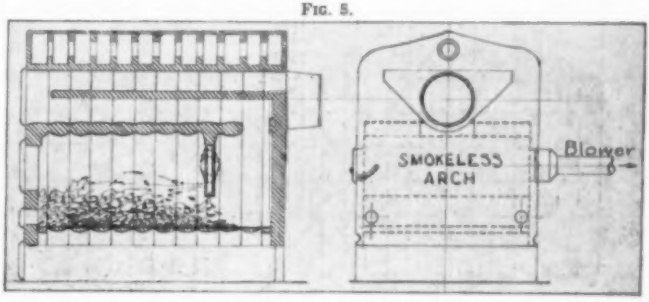
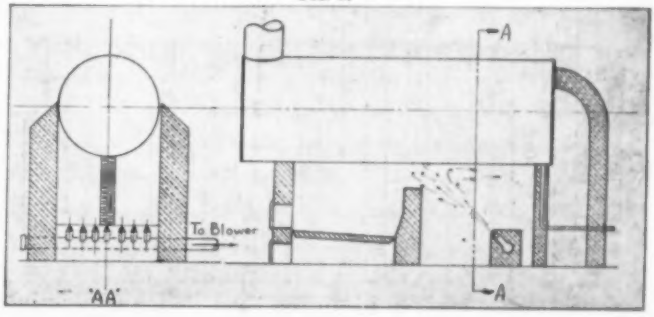


FIG. 6.



How Much Is Your Plant Worth?

By
Robert H. Emerick
Consulting Mechanical Engineer
North Charleston, S. C.

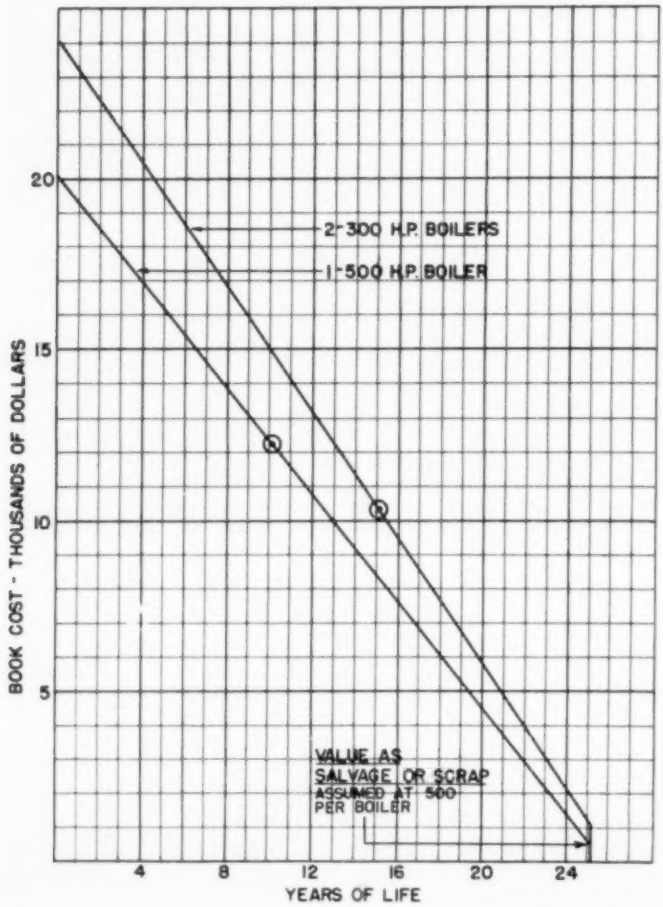
Good records may mean the difference between starting again or staying out of business after disaster strikes.

IN the unhappy event that our plant is destroyed by fire or wind-storm, the answer to the question in the title to this article may be a grim: "Much more than our books show."

The fact is that book records of historical costs, with straight line depreciation curves set up for tax purposes and production accounting, do not represent actual cash values except on the day of installation, or thereafter by coincidence. And insurance companies ask that claims of loss indicate the actual cash value of every item, at the time of loss.

To illustrate the difference between book values and the insurance interpretation of actual cash value, suppose we assume our boiler house has been destroyed by fire, together with all the equipment it contained. We'll say our loss includes 2—300 hp water tube boilers, and 1—500 hp unit, all stoker fired, and installed 15 and 10 years ago, respectively.

FIG. 1. BOOK VALUE DEPRECIATION CURVES FOR 1-500 AND 2-300 HP BOILERS.



Depreciation Curves

Figure 1 shows the commonly used straight line depreciation curve that stretches between book costs and salvage or scrap values recoverable at the end of the equipment's life. In this case, we will estimate that our boilers are worth $500 each for scrap, after 25 years of service. Incidentally we might note right now, that boilers are not received with enthusiasm on the second hand market. Their settings are useless, and the transportation to a new site, erection and leak-stopping work, tends to run the cost so close to the price of new equipment that few buyers are attracted.

What Kind of Cost?

Sliding down the curve from the $24,000 book cost of the 2—300 hp boilers, we note they now have, after 15 years in service, a depreciated book value of $10,200. The 500 hp unit has depreciated from $20,000 to $12,200. And if this is what we have been paying premiums on, we can expect the insurance carriers to pay us a total of $22,400 to help buy three new boilers.

At this moment, the grimness of

the situation becomes clear. Boiler prices have doubled, and we face a bill of $88,000 for the new units, with little more than ¼ of this amount coming in from insurance. The difference is new capital we must put into the business, and immediately, to keep the plant running.

We can never expect to cover our losses 100%, but we can do much better than 25% if we take the time and effort, to evaluate our plant on the basis of market conditions. The current market is what determines actual cash value at the time of the loss, and not the historical records.

Cash Value Curves

Figure 2 indicates the theoretical cash value curves for various market conditions. At $80 per boiler horsepower, which we have assumed to be the market price at the time of our fire, these curves show our 2—300 hp boilers to have a theoretical cash value of $19,700, and the single 500 hp unit, $24,000. If we next modify these values with obsolescence allowances, we reach a practical cash value.

Obsolescence Curves

Obsolescence is determined from the curve, Figure 3 and applied against the current market price. For example the curve shows 10.2% obsolescence after 15 years of boiler life, and 5.5% after 10 years. As the 2—300 hp boilers now cost $48,000 on the current market, the obsolescence reduction is 10% of this, or $4896. For the 500 hp boiler, 5.5% of $40,000 is $2,200.

Correcting for this obsolescence reduces our theoretical cash values by a total of $7,096, and leaves us with a soun dclaim of $19,700 + $24,000 less $7,096, or $36,604. Obviously, our practical cash value so determined, is $14,204 more than we could hope to get from the book depreciation curve.

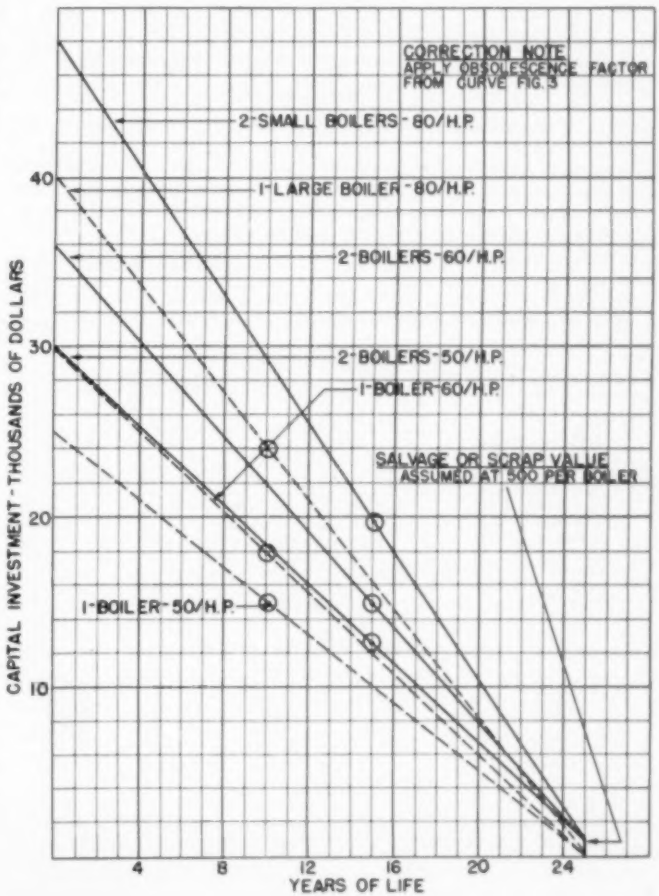
Some comment on the obsolescense curve is in order. A machine suffers from a growing obsolescence as the builder incorporates improvements in his later models. These improvements are expressed in greater efficiency, greater convenience, a more dependable design. Some machines become obsolete faster than others, but steam boilers and their firing equipment are not at the moment in the class of rapid change. Improvements in design, in better water circulation, in producing dryer steam, have not been revolutionary in the opinion of this writer, across the past 15 years. In fact, much of the efficiency of boiler output, is a flat responsibility of the boiler operator. He can get 80% with care, and 50% with carelessness. In consequence, the obsolescence curve is drawn flat for the first 4 years after installation, and turns upward at a moderate rate thereafter.

Machinery Index Card

Figure 4 suggests a form of machinery index card, by which we can keep up to date on the condition, age, and actual cash values of the equipment in our plant. Sometimes merely an extension of an existing form, say the capital records form, or even the repair record form, will suffice. The important thing is to get these values set down on paper, somewhere. The situation becomes clearer when we recognize the fact that accounting records and insurance records are separate and distinct bodies.

Many insurance companies recommend that a revaluation of the plant be accomplished every year. This is not difficult to do if we maintain forms similar to the one illustrated in Figure 4. Telephone calls to manufacturers of major

FIG. 2. ACTUAL CASH VALUE CURVES FOR 1-500 HP AND 2-300 HP BOILERS, BASED ON ASSUMED MARKET PRICES $50, $60, AND $80 PER BOILER HP.



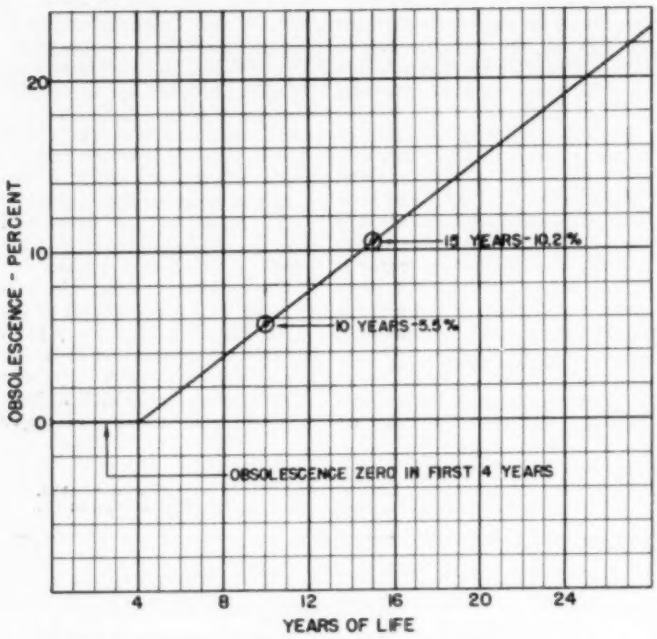


FIG. 3. OBSOLESCENCE CURVE FOR 1-500 HP AND 2-300 HP BOILERS.

equipment quickly bring usable figures, and indicate the trend of the market. Thus three or four days work a year on key items, may save us thousands of dollars in the event disaster occurs during periods of rising prices and inflation. With reversed trends, there is no sense in paying premiums disproportionate to the costs of new equipment. We stand to win both ways.

Record Keeping

From time to time some organizations, and particularly public utilities, retain expert appraisers to evaluate their properties. There are no less than four classes of valuation, each of which serves a specific purpose. These values are:

a—The historical cost.
b—The current depreciated book cost as of some selected date.
c—The reproduction cost at the time of the appraisal.
d—The salvage of scrap value at the time of the appraisal.

The historical cost should incorporate many items that never get into capital set-ups of many small and moderate sized industries. For example, principals setting up a business may fail to include the value of their own time and efforts in preliminary organization and financing.

Here is how one firm of engineering appraisers evaluated the preliminary and miscellaneous capital costs of a public utility company, in the absence of historical records on the various items:

Preliminary Organization	2.0%
Administration and Legal	2.0%
Insurance and Taxes During Construction	1.5%
Interest During Construction	3.0%
Financing Charges and Expenses	3.0%
Total	11.5%

How many of these costs appear in our own historical record? Whatever we have left out actually affects adversely the book depreciation curve; we may be charging off each year substantially less depreciation than we should.

Undistributed charges such as these, contribute to the installation cost of every piece of equipment that goes into our plant. Every estimator knows this fact, but we should be careful to add these percentages to the individual units on our actual cash value index. If we carry these items in a separate account, our unit values fail to reflect them, and the comparison between historical costs and replacement costs is not realistic.

Actual cash values can be useful at times of transfers in plant

FIG. 4. MACHINERY INDEX CARD.

CASH VALUE INDEX FOR MACHINERY

Unit _____
Make and Model _____
Rating, Power, Capacity, etc. _____
Number of Units _____
Serial Numbers _____
Purchased: Date _____ **New** _____ **Used (Give Age)** _____
Installed: Date _____
Purchase Price _____
Cost Installed _____
Life for Depreciation: Years _____
Estimated Scrap Value _____
Other Data _____

REPRODUCTION COSTS

Date Made	Cost in Dollars	Improvements In New Machines	
1949		Major	Minor
1950		Major	Minor
1951		Major	Minor
1952		Major	Minor
1953		Major	Minor

OBSOLESCENCE FACTOR

Date of Accelerated Obsolescence: (Note dates on which major improvements in new equipment increase rate of obsolescence of present units)

ownership. Transactions based on historical costs and, or, book depreciated values, are potentially unjust to the seller during periods of appreciated values. Conversely, during business depressions, book depreciated valuations conceivably can impress a hardship on the buyer, particularly if the market remains deflated for a long period.

The factor of salvage of scrap valuation is one that few plants wish to meet, except in the normal end of individual pieces of equipment, which are replaced. The sum realized is never equal to our hopes. For example, consider a district steam utility company, with approximately 200 customers, that gave up the ghost in the late 1930s.

The historical cost of the complete property, franchise, plant and distribution system, totalled $312,-314. After seventeen years, with the business in receivership, an appraisal set the reproduction value on current market prices at $309,-418, and the estimated scrap value at $20,288.

The receiver decided to sell out for scrap, because the underground distribution had been so poorly engineered and maintained, that profitable operation appeared beyond attainment. After a year of advertising and sales effort, the place finally went—for a total of $4,000 cash.

The significance of this incident is clear: our plant while operating may be worth a fortune, inoperable its value is picayune.

Details Essential

Returning to our own fire-swept oiler house, the method shown for fixing the actual cash value of our boilers, should be applied to each piece of equipment in the plant. And we should do it before disaster arrives, remembering that fire can be expected to occur sometime in every plant. It may be merely smouldering waste in a rubbish can, or a coal fire that destroys a bunker—or even in a well managed plant, real disaster.

Detailed plant appraisals, in the form practiced by public utilities who need such data for rate making and tax purposes, is a lengthy and costly job. Mechanical engineers inventory and price the mechanical equipment; electrical engineers give similar attention to the electrical plant; structural engineers and architects concentrate on buildings and structures; real estate experts evaluate the land. The complete job from field inventory to finished report may stretch out for a year or more and cost the utility a half million dollars.

Obviously small and moderate sized plants cannot undertake anything so extensive as this, but a detailed inventory is essential. It is not enough to say: "We have three boilers, six pumps, two engines, one turbine, one drill press, two lathes, thirty motors, etc."

To value what we have, we must know all about it: the size, model, age, horsepower, make, etc. Cataloging these data is not too much of a chore if the head of each department inventories the equipment in his own department, using previously prepared forms. Pricing and reproduction figures then may be added by one individual delegated to the job. In cases of uncertainty, an experienced appraiser or valuation engineer might be called in for a few days at the start and again at the finish. His fee is then the only outside expense entailed.

The value of every plant of course, at any selected moment, is affected by its physical condition. For instance, the actual cash value of our three boilers as taken from the curves, assumes they were enjoying proper maintenance at the time of the fire. Every insurance carrier peeps in on his clients' properties from time to time, and if we have been operating with ragged and missing insulation, fouled and corroded boilers, ailing pumps and turbines, a dirty and unkempt building, we can expect that our claims of actual cash value will be knocked down. Our remissions are recorded in offices other than our own—exactly where they will do our claims the most damage.

How Much?

To summarize, the answer to the question, "How much is your plant worth?" is not single, but fourfold. It is worth for capitalization, accounting, and tax purposes, what the book cost and book depreciation figures show; the reproduction costs and actual cash value determine its insurance value, and in addition, may be used for refinancing. Scrap value presents a most unpleasant fact.

Our responsibility is to get the correct valuations on the records, in their proper places.

Over Fire Air Systems

Continued from page 73

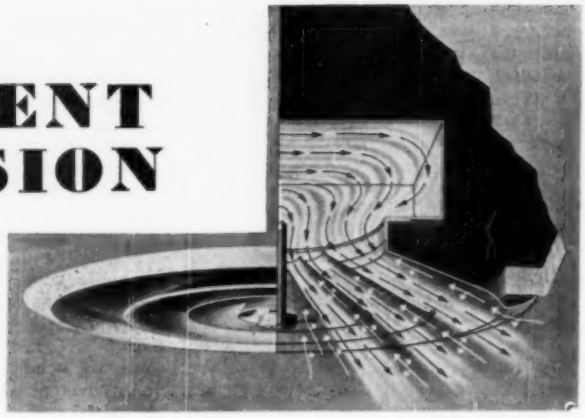
the main bridge wall. With sufficient fire box temperature most of the smoky gases are consumed at this point and smoking is practically eliminated. The blower is left on continuously. This type of installation is not suitable for coal.

With the exception of the wood-burning installation, the blower on all the described jobs should be started before firing is begun and continued for several minutes thereafter. During this interval, burning is accelerated and the fire box temperature is raised to the extent that most of the volatiles in the fuel are driven off rapidly. The use of an electric eye or photo cell relay for smoke detection and blower starting overcomes the greatest difficulty with the equipment, which is the "human element", or getting the fireman to use it. Usually, however, and especially with small installations, the cost of automatic control equipment will exceed the cost of all other equipment combined.

The success of any overfire air installation is dependent upon the quantity and penetration of auxiliary air, and good penetration is obtained through the use of correctly designed nozzles and headers. The obvious objective is to provide the right amount of air to the right place at the right time, but to do this effectively without excessive cost is not always easy.

Get EFFICIENT DIFFUSION

By F. Honerkamp
Chief Engineer
Anemostat Corporation of America



METAL CONES OF THIS AIR DIFFUSER ARE DESIGNED SO THAT THE PASSAGE OF INCOMING AIR (BLACK ARROWS) THROUGH THEM SIPHONS A SERIES OF COUNTER-CURRENTS OF ROOM AIR (WHITE ARROWS) BACK INTO THE CONES. SIMULTANEOUSLY, AIR-EXPANSION WITHIN THE CONES GREATLY REDUCES THE INCOMING AIR VELOCITY. IN THIS WAY, THE SUPPLY AIR IS PRE-MIXED WITH ABOUT A THIRD OF ITS VOLUME OF ROOM AIR WITHIN THE DIFFUSER BEFORE THE MIXTURE IS SLOWLY AND THOROUGHLY SPREAD THROUGHOUT THE ROOM IN A DRAFTLESS PATTERN.

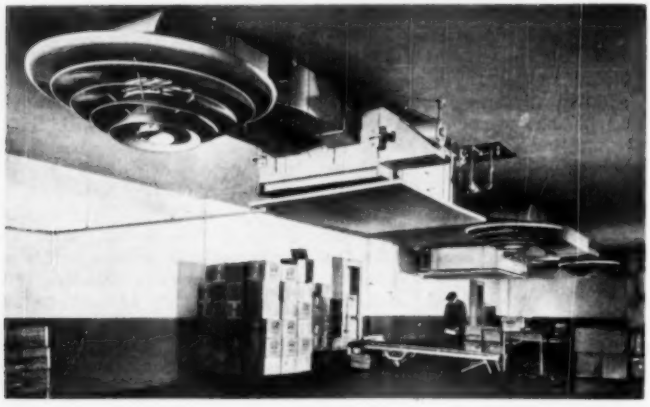
Merely to have sufficient conditioning capacity is not good enough. It must be properly distributed to the areas served.

THE owners invest money in industrial air conditioning systems to satisfy requirements which are essential for production and business, or for competitive reasons.

Conditioning in working areas can contribute decisively to the efficiency and well-being of the occupants, avoid discomfort and annoyances due to high temperature, high humidity, dirt, drafts, stale air, noise, and provide a perfect indoor environment. It will create good will, an important consideration in the complex relationship between employer and employee. Air conditioned work areas, therefore, are justified for economic and competitive reasons.

Perfect indoor conditions can be created only by an effective air conditioning system. People have become much more critical of the conditions to which they are subjected than they were some years ago, and industrial workers are no exception. The hundreds and thousands of men and women in industry, varying widely as to age and state of health as well as in the amount of clothing they wear, are by no means less critical of the air conditioning system than, for example, the patrons in a theatre or even the man who buys an air conditioning unit for his home. They will blame management for any shortcomings of the air conditioning system. And for this reason, a system should be installed which definitely improves indoor conditions.

DIFFUSION EQUIPMENT IN A LARGE DAIRY PRODUCTS PLANT.



It is not difficult to make the air conditioning system of a new building a congruous part of the whole structure and to design it in such a manner as to provide satisfactory indoor conditions. The installation of efficient air conditioning in an existing building, however, is not so easy. There are various requirements that must be carefully considered to make the air conditioning of a building a success and it is well to stress the need for careful planning, regard-

less of the type of equipment or system used. It must be kept in mind that the requirements will be influenced by the building characteristics, the location of the building, the occupancy and the lighting load, as well as by the make and capacity of equipment in use and the individual usage of the equipment.

Central Duct System

The central station system of air conditioning is usually a field assembly of factory-made, functional parts—although a factory-made unit comprising all essential items of equipment may also be employed as a central system. There is today a definite trend not only toward lighter, but also toward more compact units to save weight and space. Due to variations in layout limitations and other considerations, the design of the system will always have to be adapted to the special needs of the different buildings. This is necessary to provide better control of conditions and greater flexibility, as well as to guarantee overall economy and good performance.

The central station system does not interfere with the design of the areas, provided an unobtrusive and decorative outlet is used where appearance is important. In such a case, the outlet can be made a part of the overall architectural design. At the same time it is possible to create that optimum of good air distribution which can rarely be achieved with any other system than the central duct system.

Distribution Outlets

An outlet for air conditioning systems must be attractive in appearance, but more important, it must be scientifically-designed so as to distribute the air in a draftless pattern. Such a device is attached to an air duct opening—on it depends the success or failure of the entire system.

Properly distributing conditioned air would be a simple matter if a duct the same size as a room were practical. Air, at desired room temperature, could then be passed through the duct at low velocity and would push existing air out of the room without causing drafts.

Since this is obviously impractical, air must be reduced in temperature and delivered in small ducts. Duct velocity must be high enough to establish the desired over-all room temperature. Cold air then enters the room and, as its velocity is expended, and it mixes with the warmer room air. The desired over-all room temperature and humidity is thus theoretically established.

If incoming air enters the room through simple grilles, registers, or perforated panels, it is likely to sweep from these fixtures in a cold blast. Under such conditions, after the sweep of air is detoured about the room by the various objects it encounters, it eventually expends its velocity, and then mixes with the warmer room air. As a result, parts of the room may be drafty.

Once the velocity is expended, cold air settles to the floor and warm air rises to the ceiling. The over-all result is a drafty room containing many over-cooled spots, as many under-cooled spots, and too many stagnant air pockets.

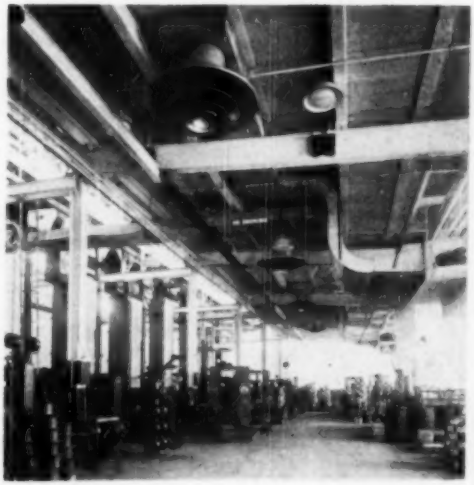
Diffusers

At many plants and in many buildings where air conditioning troubles have developed, such conditions as described above have been eliminated by replacing registers and grilles with aspirating air diffusers. These scientifically designed devices mix incoming duct air and room air within the diffuser before the mixture is circulated in the area to be conditioned.

A good diffuser usually consists of a series of flaring metal cones, assembled concentrically with an exact relationship to one another.

(*Continued on page 135*)

THIS VIEW SHOWS HOW AIR IS DELIVERED TO THE WORK SPACE IN AN EQUIPMENT MANUFACTURING PLANT.



AN INSTRUMENT MANUFACTURING COMPANY DISTRIBUTES AIR TO EMPLOYEES DOING FINE ASSEMBLY WORK.

Why Keep LOGS and REPORTS ?

By Sam'l S. Williams
Consulting Engineer
Birmingham, Alabama

Keeping adequate production and performance records is not a dead expense. They pay off in better economy and increased respect for your department.

MANY executives and industrial managers leave the impression on the engineer that they regard the service department of their factories as a "necessary evil", and that any thought in regard to its operation is painful.

Possibly this accounts for the meager detail regarding the cost of steam, electric energy, water, and compressed air, that is disclosed on the books of the accounting department. Seldom can a comprehensive record of production and plant uses and costs for these services be found for comparison or study to locate possible wastes in production or use.

Industries having service costs that run into one hundred thousand or more dollars per year often have no records except the total cost of fuel and the purchased power bills. Plants generating a portion of their own electric power often have no metering equipment. And more often than not, if meters are installed, no regular readings are taken and recorded, and no reports are made. The same is true of the boiler plant. Sometimes, especially where new boiler or modern firing equipment has been recently installed, a full complement of instruments and recording meters will be found, but even so, no comprehensive records are kept and the actual performance of the equipment and the plant as a whole remains a matter of guess work.

Too often a question regarding service departments will be answered by: "We generate a part of our power and buy the balance", or "We use a very little part of our steam for process, but of course we have to provide heat in the winter time. Ask about some production department of the factory and the answer would be something like this: "30% of this, 20% of that and 50% of this other: 9% is exported to Timbuctoo, 1.8% to Wheresit, 12% to Alaska, 8% to the Argentine: 67% domestic, 2% to employees, and .2% is rejects.

The conclusion is that if adequate records were kept the answer to our first query might be: "We generate 63% of our electric energy and use the turbine exhaust for process steam, supplemented by 5% live steam for operating control. We buy 37% of the electric energy, and find that this is about as close as we can work with our existing load factor. Our steam cost is $0.4638 per 1000 pounds equivalent, and our combined cost of electric energy is $0.010129 per kwh. Department "A" uses 20% of the steam, 38% of power and 3% of the water. Department "B"—etc., etc."

With a knowledge of unit costs and a breakdown of where service is used, any unusual deflection of either cost or quantity from the production figure will soon lead to the cause. And if a waste exists, it can be quickly remedied before appreciable losses occur.

It has long been a wonder in the minds of engineering observers just why an owner will invest a half million dollars in a boiler plant, buy a quarter million dollars worth of fuel each year, and then put it all in charge of an employee in whom he seems to have so little confidence that he would not trust him to drive his $3,000 car around the block. And in addition he requires no accounting for the performance of the boilers, or the use of the fuel, save that steam be available when required.

This is undoubtedly the fault of the engineering profession in not stressing the importance and value of service cost accounting, and in failing to develop, as a part of plant design, operating log and report forms that would provide pertinent information for the owner.

Manifestly the owner or plant management should not be expected to know all of the details that enter into effective and efficient service department management, especially boiler plant and electric generation problems, and but few of the factors that enter the final cost of steam or power. But he should be furnished a report showing the plant performance, for day by day comparison. This report should also show production and quantity consumption figures, such as weight of steam and kwh generated and pounds of coal consumed. This should be shown in such a manner and with such accuracy that the accounting departments can post them.

It is the writer's well considered opinion that any well managed and departmentalized manufacturing

establishment should develop cost records, and distribute and charge out steam, power, water and other services necessary to the department's operation, in the same manner that other supplies are handled. This makes the department head cost conscious in the use of the services, and tends to reduce waste. It also furnishes him a true cost sheet so that he will not be misled when he is asked to estimate production for special goods. Furthermore it furnishes the executive a positive figure instead of a blind guess, and keeps him keenly alive to the magnitude of service costs, and the needs of the service department.

In most instances it is desirable to have all services under one head, and their management concentrated in the boiler and power plant. The attendant in a modern boiler plant usually has time enough to read the production and distribution meters and prepare the daily reports. The responsibility and interest in recording the results of his work will keep the attendant alive to the needs of the plant and the importance of his functional attentions, and will (in nine cases out of ten) produce a more valuable employee.

The executive can have the reports pass over his desk and a glance at one or two of the significant figures will give him the key to the operations. Likewise, should there be any question that requires consultation with the head of the department, the factors contributing to any special operation or disturbed routine will be delineated on the report so that explanation of the condition will be clear and concise.

Savings—Case 1

The value that can be had from knowing what goes on in the boiler house is shown by the following example.

The executive officer of a textile mill having a fuel bill of about $20,000 per year was in a quandary regarding the quality of coal to purchase under an annual supply contract, and secured specialized engineering services to advise him.

Having no records other than coal bills, although fully equipped with flow meters, it was necessary for the engineers to conduct coal trials. These trials were conducted as daily operations and immediately disclosed that the preventable losses taking place under average good firing practice would offset many times the difference in coal quality or price spread.

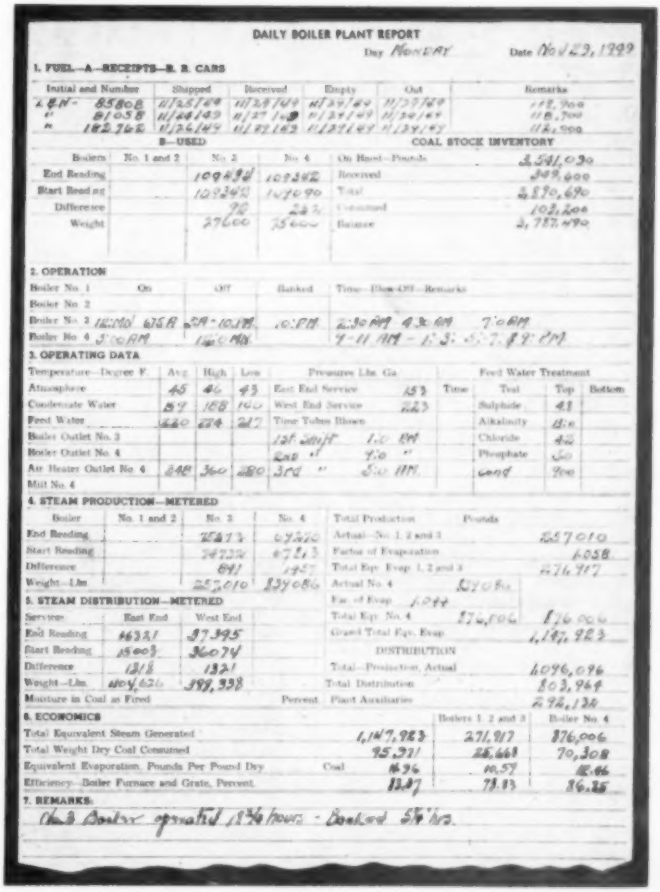
By setting up an annual cost system on a basis of the conclusive trial results, a program of improvement was instituted. This included daily log and period cost reports, wherein all charges for the supervisory work was included in the steam cost. Maintenance was also charged, and no capital was spent, so that all savings were net. These savings are shown by 4-week periods in the accompanying tabulation.

Another textile mill running their steam plant "blind" was unable to satisfy demand for steam and sometimes discontinued the operation of a department in midshift from this cause.

Savings—Case 2

Through a plant survey the load was determined to be 1610 boiler horsepower, and wasteful distribution and use was disclosed. The management was disinclined to invest in weighing or metering apparatus at that time but was interested in conserving steam, and employed specialists to tediously seek out losses and evaluate production and costs.

Within a year the load was reduced to 1200 bhp and full production of all departments was possible and fair steam service was maintained. Better heat use cycles were developed at slight cost and



DAILY BOILER PLANT REPORT

Day MONDAY Date Nov 23, 1949

1. FUEL—A—RECEIPTS—B. B. CARS

Initial and Number	Shipped	Received	Empty	Out	Remarks
L&N- 85808	11/25/49	11/28/49	11/29/49	11/29/49	112,900
" 81058	11/26/49	11/27/49	11/29/49	11/30/49	118,700
" 182,762	11/26/49	11/27/49	11/29/49	11/30/49	114,500

B—USED

COAL STOCK INVENTORY

Boilers	No. 1 and 2	No. 3	No. 4	On Hand—Pounds	
End Reading		109498	109342		2,541,030
Start Reading		102342	102490	Received	309,600
Difference		70	2852	Total	2,850,630
Weight		27600	15600	Consumed	102,600
				Balance	2,748,030

2. OPERATION

Boiler No.	On	Off	Banked	Time—Flow Off—Remarks
Boiler No. 1				
Boiler No. 2				
Boiler No. 3	12:00 AM	7:30 AM	10:00 PM	2:30 AM 4:30 AM 7:00 AM
Boiler No. 4	5:00 PM			7-11 AM - 1:30 - 5:30 - 8:30 PM

3. OPERATING DATA

Temperature—Degree F.	Avg	High	Low	Pressures Lbs. Ga		Time	Feed Water Treatment		
							Test	Top	Bottom
Atmosphere	45	46	43	East End Service	183				
Condensate Water	157	168	140	West End Service	223		Sulphite	41	
Feed Water	220	224	217	Time Tubes Blown			Alkalinity	116	
Boiler Outlet No. 3				1st Shift	1:0 PM		Chloride	42	
Boiler Outlet No. 4				End "	7:0 "		Phosphate	50	
Air Heater Outlet No. 4	348	360	280	3rd "	5:0 AM		cond	700	
Mill No. 4									

4. STEAM PRODUCTION—METERED

Boiler	No. 1 and 2	No. 3	No. 4	Total Production	Pounds
End Reading		26873	67520	Actual—No. 1, 2 and 3	257,010
Start Reading		24732	67213	Factor of Evaporation	1.058
Difference		641	1457	Total Equ. Evap. 1, 2 and 3	271,917
Weight—Lbs		252,010	339,086	Actual No. 4	591,096
				Fac. of Evap. 1.044	
				Total Equ. No. 4	376,006
				Grand Total Equ. Evap.	1,147,923

5. STEAM DISTRIBUTION—METERED

Services	East End	West End	DISTRIBUTION	
End Reading	46321	37395	Total—Production, Actual	4096,096
Start Reading	45003	36074	Total Distribution	803,964
Difference	1318	1321	Percent Plant Auxiliaries	292,132
Weight—Lbs	404,626	369,338		
Moisture in Coal as Fired		Percent		

6. ECONOMICS

		Boilers 1, 2 and 3	Boiler No. 4
Total Equivalent Steam Generated	1,147,923	271,917	876,006
Total Weight Dry Coal Consumed	95,231	25,663	70,308
Equivalent Evaporation, Pounds Per Pound Dry Coal	12.96	10.59	12.46
Efficiency—Boiler Furnace and Grate, Percent	73.87	73.13	76.25

7. REMARKS:

No 3 Boiler operated 1836 hours - Banked 564 hrs.

Actual Saving Attributed to Better Records

Period			Average Steam Cost/M Lb	Period Saving $
Previous Year			$.3367	$ 0.00
4 weeks ending		6/20	.2992	391.42
4	"	" 7/18	.3041	160.34
4	"	" 8/15	.2764	309.11
4	"	" 9/12	.2593	467.19
4	"	" 10/10	.3092	152.14
4	"	" 11/7	.2645	564.46
4	"	" 12/5	.2702	734.16
4	"	" 1/2	.2655	702.02
4	"	" 1/30	.2484	882.21
4	"	" 2/27	.2469	929.65
5	"	" 4/3	.2676	761.78
4	"	" 5/1	.2641	549.42
Steam cost saving over previous year				**$6,603.90**

the production of jig and raw stock dye processes was increased 37.5%.

Armed with carefully developed load studies and steam cost figures the specialist was able to justify new boiler equipment estimated to cost $48,500. The actual installed cost was $48,758 and the fuel bill was reduced from $55,917 to $36,-363 providing a net saving of $19,-550 in addition to improved service that allowed full production.

Meters having been secured with the new installation, log sheet and report forms were provided and steam production and distribution is now shown daily. A period report is made up monthly, being a summary of daily figures, and showing steam cost per 1000 pounds. An annual report covering the fiscal year and indicating the percentage loss or gain as a whole and by department is submitted, which for the six years succeeding the installation has kept the management fully informed of the economics under changing fuel prices and growing plant loads.

Sample Log Sheet

A simple report form covering a fairly complicated production and distribution situation is presented here. Due to old boiler equipment being retained for "stand by" and peak load service during severely cold weather, two operating pressures are involved.

It will be noted that the report provides a perpetual coal inventory. Steam distributed is metered and recorded as actual weight but for economy calculations it is converted to the "equivalent" value to give a consistent production figure. Coal is calculated to dry base. Steam pressures and pertinent temperatures are reported as average, high, and low. This is to give a key to any abnormal condition of operation that would not otherwise be obvious without an inspection of the chart records.

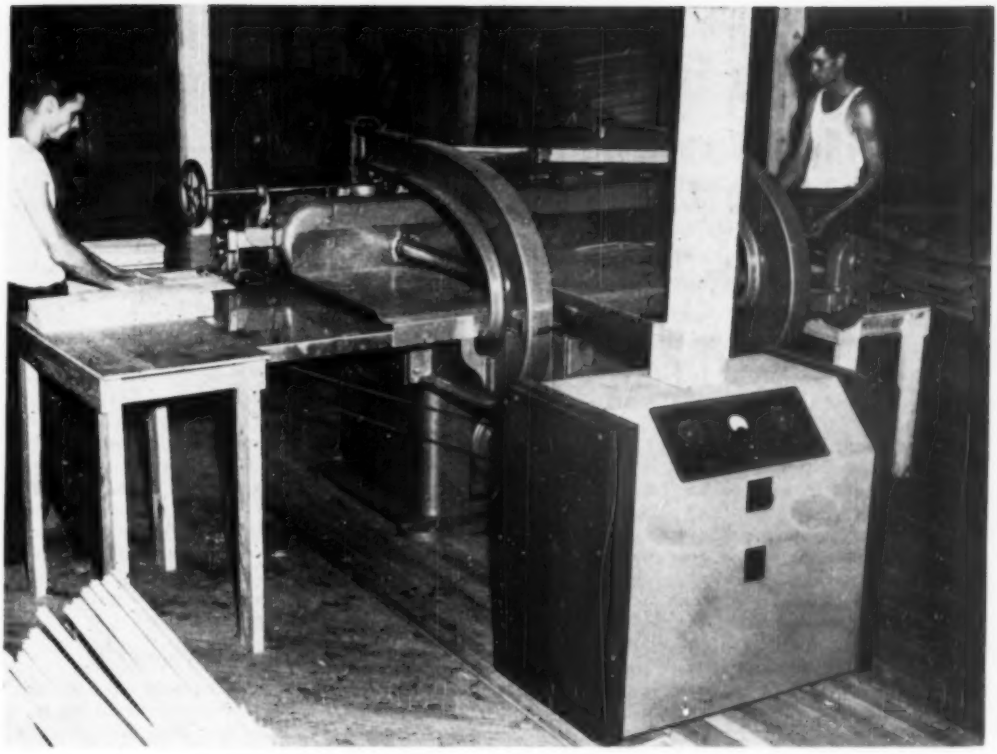
The steam shown as going to plant auxiliaries is special to this particular plant and includes the steam used by the deaerating feedwater heater, whether as exhaust from the boiler feed pump drive, or as direct steam. Its quantity is increased by the fact that excess capacity of the heater is used to bleed some hot water for process work, and to balance the boiler load.

In the opinion of this writer the way to get the service department out of the "headache" class is to show by records and reports that it is a well managed department of the business establishment; that its performance is such that the owner may well be as proud of it as he is of his new office, his lighting, air conditioning, or intercommunication system. Let's give him a picture that he can see.

Kansas Gas and Electric Company Shows Public

Its New 30,000 KW Generating Unit

President Gill of KG&E is shown watching Kansas' Governor Frank Carlson open the throttle—officially starting the third 30,000 kw generating unit at the Company's Ripley Steam Electric Station near Wichita, Kansas.



R-F Heating Increases Production

for Alexander Wood Products — Athens, Georgia

AT the Alexander Wood Products Company in Athens, Georgia, a highly successful r-f heating installation is gluing 3/16" thick stock at an average speed of 60 feet per minute. The equipment consists of a tapeless splicer, with a Westinghouse 2-kw, 15-mc, high-frequency quick glue set unit supplying the necessary heat to operate the machine at top speeds for all current veneer thicknesses. An adjoining splicer, using regular strip heaters temperatures encountered when r-f equipment is not used.

Less Conditioning

Normally, for 3/16" stock at 20 feet per minute, a temperature of 425 F is required. But, when r-f equipment is used, only the bottom heater strip supplies heat and a temperature of 250 F is sufficient. Thus, less conditioning of the veneer is necessary after the gluing.

The use of the 15-mc frequency Westinghouse generator has resulted in higher operating speeds and more uniform results than previously experienced.

Savings

The Alexander Wood Products Company has used this new equipment primarily for 3/16" stock. They have been unable to give complete savings figures, but on a manpower basis, however, it is possible to produce approximately 2½ times as much material. Generally, two operators are used at a rate of approximately $1.00 per hour per man; therefore, a savings of approximately 24 man-hours per day (or $24.00 per day) is realized.

For experimental purposes, the Alexander Company ran stock from approximately 1/20 to approximately 5/16" thick, and in all cases were able to use the top speed of the machine which is 85 feet per minute. However, this was not on a production run, therefore, the figures would have to be scaled down considerably. They found that they were able to run the 3/16" stock at 85 feet per minute and get a good bond, but the operators were unable to run the machine at this speed all day long. Therefore, a speed of approximately 60 feet per minute has been adopted.

This equipment has been in operation now for approximately three months. During that period it has been completely trouble-free and reliable.

Problems in Reporting and Measuring Production

This time study engineer has devised standards that conform with units and has developed report forms that the workers will use.

By A. Bush Enos

Time Study Engineer
Kingan & Co.
Richmond, Virginia

THE relationship between units studied and units in which the rate is expressed is of prime importance to the time study engineer in setting production standards. In a shipping operation, for instance, studies may be made in terms of loads, boxes, or pieces; yet it is often necessary to express rates in terms of pounds.

Standards constitute a method of measurement, usually in terms of hours per unit. Whether used to control incentive bonus payments or to determine only departmental efficiencies, they demand parallel production units. The familiar formula,

$$\text{Per Cent Efficiency} = \frac{\text{Stnd. Hrs. per Unit} \times \text{Units Produced}}{\text{Actual Hours}}$$

furnishes a popularly accepted system. Obviously, where **per cent efficiency** must be determined at regular periods, such as the end of a fiscal week, **units produced** must be arrived at accurately and promptly.

Production Report Form

In our plant, where the foremen are directly responsible for paper work, it becomes urgent that tallies, re-caps, or statistical reports be kept at a minimum. A typical brief production report form is illustrated. We prepare such a form for each plant department, marking it off in daily sections, and reserving a *total* column opposite each unit size or designation. This total is our unit production for the period and furnishes the figure entered opposite a corresponding *standard time* per unit on the proficiency report or bonus sheet. For the convenience of payroll clerks, we follow the practice of numbering units on our production sheet to synchronize with numbers of applicable standards on the proficiency sheet.

Standards

Standards are prepared and provided to coincide with units in common use; most product counts are those already being reported to other plant or office departments. We would not, for example, ask for a product reported to the In-Cure department in terms of *pieces*, to be reported to us in *pounds*. Thus, daily entries to the production sheet amount to not

IN PLANTS LIKE KINGAN & CO. OF RICHMOND, VA., WHERE FOREMEN ARE DIRECTLY RESPONSIBLE FOR PAPER WORK, STATISTICAL REPORTS MUST BE HELD TO A MINIMUM. THIS TYPICAL PRODUCTION REPORT FORM IS BRIEF TO CONSERVE SUPERVISORY TIME; AND THOROUGH, TO COVER ALL UNITS AND SIZES PRODUCED; AND DIVIDED SO THAT EACH DAY'S UNITS MAY BE RECHECKED SEPARATELY.

INEDIBLE RENDERING PRODUCTION

W/E.....

STD.	OPERATION	UNIT	MON.	TUES.	WED.	THUR.	FRI.	SAT.	TOTAL
1-A.	Charge Tanks—3 Tanks/Day	Tank							
1-B.	Charge Tanks—4 Tanks/Day	Tank							
1-C.	Charge Tanks—5 Tanks/Day Under 1400 Hogs	Tank							
1-D.	Charge Tanks—5 Tanks/Day 1400 Hogs or Over	Tank							
2.	Position & Remove Manhole Aprons-Pos. & Fasten Covers	Tank							
3.	Cleanup After Close Tanks	Day							
4.	Skim Catch Basins—Dump	Buggy							

more than ten or twelve minutes of the foreman's time.

Unit of Measurement

Up to this point, the subject problem does not appear acute. It seems, at first glance, simply a matter of counting pieces and writing down the number. It is not that simple! Any production man knows how quickly the output from a lineup can run into hundreds and thousands, even on a fairly large item. Physical limitations dictate that tallies must come through various methods and sources. Stock transfer sheets from counts of original or previous departments, automatic counting devices, scale clerks' records contribute a few of them. The nature and packaging of the product usually indicates the method.

A tedious question of measurement arises in processing products which change their form, density, or weight during manufacture. A case in our experience occurred during study of our Inedible Products Department. This department is divided into two sections. In the first, raw animal products are dumped into batteries of huge retorts or tanks to cook under heavy steam pressure. The second concerns itself with the drying, mixing, grinding, and bagging of the product after cooking.

In the first section, we found it a relatively simple matter to take time studies on the handling and dumping of each load of material as it came from the killing department. Why not base our production on the number of loads dumped? We soon found that to be impractical for several reasons. Due to fluctuations in the amount of material assigned to Inedible by the killing (or other supplying) department, loads did not arrive in a consistently even supply. Hence, handling personnel, though required to be in constant attendance, experienced periods of waiting which could not be covered on a *per load* basis. Nor could the units killed or cut be used as a basis, because the fluctuations noted above might vary widely according to (a) weight and type of animal slaughtered, or (b) edible products being *saved* or manufactured at the time.

However, it was observed that variations in the quantity and type of reject material coming from the killing and cutting floors had a direct relation with the number of cooking tanks *charged* from day to day. And, although a certain minimum of man-hours was necessary in *charging* a tank whether it was loaded to capacity or only half full, two or three tanks were always idle on days when our hog or cattle kill were low. From this point, it was a relatively simple matter to set up standards based upon *tanks* as our unit of measurement.

In the second Inedible section, the puzzle was to arrive at a common denominator that could be used to score each step in the treatment of the substance from the time it was ejected from the cooking tanks, through each consequent process until it was finally shipped out in 100 lb bags.

The final unit, or bag, we must obviously use; but there were no counts taken, in terms of bags, in the dumping, pressing, drying or mixing operations. On the other hand, exact measurements were used, as each shovelful, each barrowload, each inch of *stick* was added strictly according to weight; and a relationship could be determined through following these measurements to the final product weight.

Therefore, it became a part of our study to weigh a series of cooked *charges* before, and then after, they went through the driers. Figuring a ratio for each product mixed, ground, and bagged, we were able to check and report daily or weekly our complete operation, by the 100 lb bag. The foreman knew, for example, that 200 units bagged on a Tuesday were 200 to be credited to his hours worked on pressing and drying the previous Monday.

Processing Delay

As in other cases of operations not measured until completion of the process, there were some questions regarding this delay in reporting. "What about material in process on Friday not measured until Monday of the following week?", we were asked. This is easily taken care of, since we do not post reports for any week until the beginning of the following week.

With department heads properly briefed concerning the importance of production counts upon their labor cost figures, we have found them enthusiastic and punctual in submitting these simplified reports.

Chattanooga Plant Constructs Giant Air Heater

More than thirty miles of 2½-inch steel tubing have gone into the giant air heater shown under construction in the Chattanooga, Tenn., shops of Combustion Engineering-Superheater, Inc. The weight of this tubular-type air heater for the Central Arizona Power & Light Co., Phoenix, is 45 tons, and it is 17 feet deep, 32 feet wide and 52 feet high. Total effective heat-transfer area for its 3550 tubes is nearly 105,000 square feet. When completed it will form part of an outdoor steam generating unit having a capacity of 675,000 pounds of steam per hour at 920 psig and 905 F total temperature.

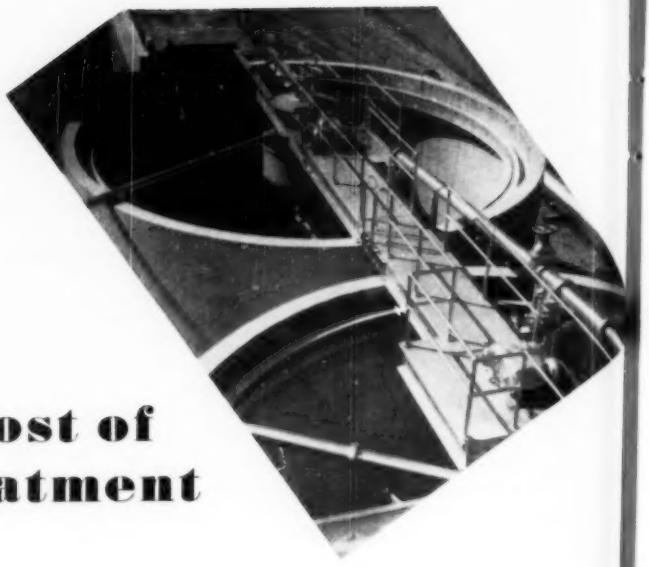


FIG. 1. AERIAL VIEW OF SLUDGE THICKENER TANKS.

Lime Recovery Plant

Reduces Cost of Water Treatment

Increasing material and production costs emphasize the need for improved reclamation and by-product procedures in industrial operations.

By C. F. Wertz
Resident Engineer

THE lime recovery plant, recently completed adjacent to the Hialeah Water Treatment Plant of the Department of Water and Sewers, City of Miami, is now producing approximately 60 tons of lime per day. The plant capacity of 80 tons per day is expected to adequately provide for all of the requirements of the Department for the next 15 years, and during the first years will provide an excess for sale to other communities. A yearly saving of from $80,000 to $100,000 is anticipated.

Miami's raw water supply is pumped from wells. Softening and color removal is accomplished by lime treatment and alum coagulation. Lime feed averages 10 grains per gallon which means a feed of above 1,800 lb of lime per 1,000,000 gallons of water treated, or 54 tons per day, when the treatment plant is running at its rated capacity of 60 million gallons per day.

For the past twelve or thirteen years calcium carbonate sludge from the clarifiers of the treatment plant has been pumped to a 20-acre lagoon. It is estimated that 8,000,000 cu ft of sludge containing approximately 45 per cent moisture are now in this lagoon.

During the latter half of 1948, prior to starting operation of the lime recovery plant, all lime needed for water treatment was shipped in from Tennessee, Missouri, and

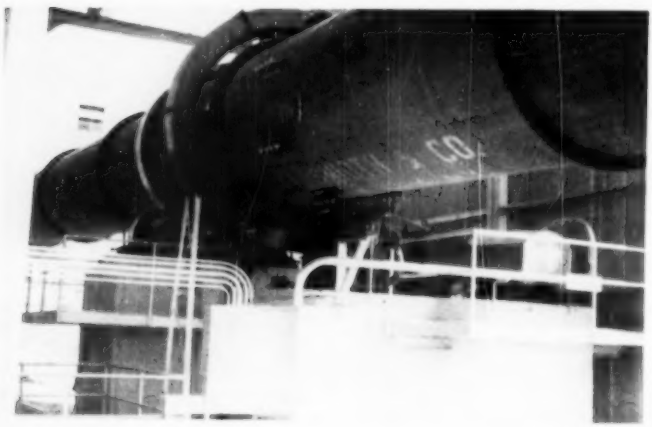


FIG. 2. KILN DRIVE PIER SHOWING MOTOR-SPEED REDUCER, GIRTH GEAR, AND THERMOCOUPLE TAKEOFFS.

Arkansas, at a cost of $18.10 per ton.

A description of the new lime recovery plant follows.

Preparation of Sludge

Efficiency of kiln operation and quality of lime produced are dependent upon the uniformity of the raw calcium carbonate sludge fed to the kiln. The greater portion of raw material is drawn from the clarifiers in the treatment plant, but sludge makeup is obtained from the lagoon.

Clarifier sludge is pumped by timeclock - operated intermittent pumps to the center stilling wells of two concrete thickener tanks, each with a capacity of approximately 8,500 gallons. Each unit is equipped with a Hardinge thickener mechanism with Auto-Raise drive and Reeves variable speed control.

Sludge from the lagoon is recovered by means of a Sauerman ½ cu yd scraper operated by an Ingersoll-Rand three-drum scraper hoist with 15 hp motor. It will be trucked to a wash mill where, by the addition of water, it will be reduced to a liquid-solid content comparable to the sludge coming from the clarifiers.

Slurry is pumped from the wash mill to the thickeners by a Wilfley Centrifugal Sand Pump, direct connected to a 10 hp motor, and from the thickeners to the slurry feeder by either of two similar pumps driven by 7½ hp motors. The F. L. Smidth & Co. slurry feeder, with a capacity of 10,000 gallons per hour is driven by a four-speed motor which permits synchronization of feed rate with kiln rotation rate by manual push button control.

The slurry is dewatered in a Bird Centrifugal Filter driven by a 60 hp motor through a multiple V-belt drive. This unit delivers a filter cake containing from 65 to 68 per cent solids by weight to the kiln feed screw.

Rotary Kiln

The kiln feed screw into which the filter cake falls by gravity from the centrifugal filter is a Link-Belt 14-in. diameter ribbon type screw conveyor. It operates at 40 rpm through a speed reducer direct-connected to a 3 hp motor. The feed screw passes through a plenum box and discharges the cake directly into the feed end of the kiln.

The rotary kiln is a F. L. Smidth & Co. four support UNAX kiln of welded design, 7-ft-6-in. I.D. by 230-ft long, with integral multi-cylinder UNAX cooler. The total weight of the fire-brick lined kiln is approximately 200 tons. The feed end of the kiln is equipped with a 37-ft section of induced-draft type heat recuperating chain (11,000 lb of figure-eight chain) to promote efficient heat exchange and rapid sludge drying. Exit gases are thereby reduced to approximately 350 F. The kiln is lined throughout with six inches of fire brick (Harbison-Walker), with certain sections backed up by 2½ inches of Johns-Manville Super-X insulation.

The kiln is driven by a four-speed motor, rated 40/30/20/15 hp at synchronous speeds of 1200/900/600/400 rpm, with V-belt drive to the high speed shaft of a Western Gear Works reducing gear. The 19-tooth master pinion is mounted on the slow-speed shaft of this reduction gear and engages a 136-tooth girth gear. The total ratio of reduction is 1060:1 and provides for operating speeds of 1.09/.85/.57/.43 rpm. A standby drive is also provided to operate the kiln in the event of motor failure. This drive consists of an International Harvester, Model V-9, gasoline-powered unit

The UNAX cooler consists of 8 cylinders around the outlet end of the kiln, equipped with conveying flights of heat-resistant cast iron. Lime from the coolers is discharged into a collecting hopper, passes through a set of grate bars, and is removed to storage by a screw conveyor and bucket elevator.

A dust hood has been installed around the discharge end of the cooler cylinders and connected to a twin Buell Cyclone Collector with an American Blower, Type E Fan, with a 3-hp, 1,800 rpm motor. It has not been found necessary to use this feature up to the present time. Since all secondary air is drawn into the coolers at this point, a slight negative pressure is maintained and dust emission is controlled.

Kiln Firing

Bunker "C" oil is delivered in tank cars and pumped to a storage tank by a Sier-Bath oil pump. Some preheat is given the oil ahead of the pumps by means of a Paracoil Heater.

The kiln is fired by a mechanical high pressure oil atomization system at from 240 to 260 lb pressure and a preheat temperature of from 200 F to 220 F.

Oil is pumped from the storage tank by two DeLaval fuel oil pumps to two tubular multi-pass fuel oil heaters, each capable of

FIG. 3. 230-FT KILN, WITH COOLING CYLINDERS IN THE FOREGROUND.

neating the required amount of fuel oil to the temperature mentioned above. Steam for heating is made in a small oil fired M kay O steam boiler.

The kiln burner is of Schutte & Koerting manufacture and consists of a 20-ft-6-in. burner pipe, calorized at the firing end and axially located in an 8-in. I.D. by 20-ft long primary air tube, all mounted on overhead rails to permit easy movement of the end shield.

Combustion Air

Primary combustion air for the kiln is provided by a blower, rated at 2,300 cfm of 200 F air, and capable of developing 8-in. static pressure at an operating speed of 1,750 rpm. In normal operation, primary air is drawn from the top of the kiln end shield, but to provide against overheating of the fan a manually-controlled damper can admit air at atmospheric temperatures.

Draft Control

Draft control is provided by a 30-in. butterfly damper in the exit duct beyond the tower scrubber but immediately ahead of the induced draft fan. The damper is operated by air pressure in a spring-balanced cylinder and is controlled manually from the central panel, or operates automatically with the oxygen analyzer control equipment. The induced draft fan, of non-overload design, is driven through a V-belt drive by means of a 25 hp, 1,160 rpm, constant speed motor. The fan is capable of handling 12,500 cfm of moisture-saturated gases at 90 F and of developing a total draft equivalent to 7½-in. of water column. The unusually low temperature and high static pressure result from the use of a tower scrubber between the feed end of the kiln and the induced draft fan.

Dust Control

Since the plant is located within a quarter-mile of the business area of the City of Hialeah and is surrounded by residential areas, it was necessary to eliminate all possibility of dust nuisance. A Bartlett Hayward water scrubbing tower with humidifier was, therefore, installed with a capacity for cooling and cleaning 20,000 cfm of kiln exit gases containing 300 lb per minute of lime dust from an initial temperature of 550 F to an outlet temperature of 100 F.

Kiln gases enter the top of a 36-in. diameter humidifier equipped with two atomizer nozzles discharging against a deflector plate. Gases pass downward to the base of the main scrubber tower, then flow upward through four water sprays spaced about ten feet apart inside the tower. Multiple layers of wood grids, installed above and below each nozzle, break up both gas and water streams, and dust removal and cooling is effectively accomplished. From the top of the tower the clean gases pass to the induced draft fan and are vented to the atmosphere through a 3-ft diameter by 80-ft high steel stack.

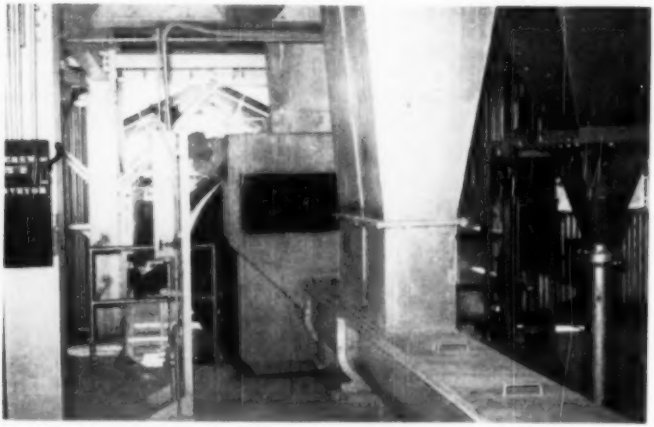


FIG. 4. RIBBON CONVEYOR FOR MOVING FILTER CAKE INTO KILN.

Kiln Control

Control of the entire installation is centralized in a main control panel on the burning floor of the discharge building. Push button controls with running lights are provided for all equipment. The control panel is of dust-proof construction and is carried on a foundation independent of the building foundation.

Lime Storage and Handling

Lime drops from the coolers into a hopper, through a sizing grate, and into a Link-Belt 9-in. screw conveyor which discharges into a Link-Belt vertical continuous bucket elevator which discharges into a steel silo. The silo was fabricated and erected by Chicago Bridge and Iron Company.

A Fuller Airveyor System transports lime from the storage silo to either one of two 100-ton bins in the chemical house of the water treatment plant, or to an 80-ton auxiliary lime bin.

Lime from the main silo is fed through a totally-enclosed star feeder into a 6-in. underground pipe line, through which it is conveyed by the combined efforts of a turbo-blower and a vacuum exhauster.

The Ingersoll-Rand turbo-blower is located directly under the storage silo and the Roots-Connersville exhauster is located on the ground floor of the chemical house. A horizontal switch in the conveying line, together with a two-stage receiver and rotary air lock on the auxiliary lime bin, provides for the diversion of lime to this bin at will. An out-of-door type filter-receiver on the roof of the chemical house provides for dust removal. A distributing screw conveyor, with reversing motor drive, is installed as part of the Fuller system in the chemical house for the distribution of material to any one of four storage bins.

Recarbonation

In the water treatment plant, the water, after leaving the clarifiers, flows to a recarbonating ba-

sin where the addition of carbon dioxide reduces the pH from 10.5, plus or minus, to about 8.5. In years past, the carbon dioxide was made by burning light distillate oil but now the lime plant exhaust gases contain approximately 25 to 30 per cent of carbon dioxide and suitable equipment has, therefore, been installed to compress a portion of this gas and send it to the carbonating basin.

The compressors are two direct-connected, Nash Hytor units, powered by 40 hp, 720 rpm motors. Since the amount of gas diverted is only about 5 per cent of the total flow, the effect on the induced draft fan and damper installation is negligible. Fisher pressure relief valves are provided on the discharge lines to the main discharge header so that pressure buildup will be nominal when the Bristol pH recorder controller at the water treatment plant tends to close the butterfly valve in the gas line to the recarbonating basin.

Service Facilities

Service air for the lime plant is provided by a Worthington two-stage, tank mounted air compressor. Compressed air outlets are located strategically throughout the plant.

All electric conduits, air lines, water and slurry piping, are installed in a straight service trench between the feed and discharge buildings to provide for accessibility and ease in maintenance. The service trench is covered with grating, except at the pump pits which are open.

The third floor of the feed end building is equipped with a Manning, Maxwell and Moore 8,000-pound capacity underhung crane and electric hoist. The hoist is so located that the heaviest part of the Bird Centrifugal Filter can be removed and lowered to the ground level if necessary. The outrigger beam of the hoist is so arranged that other heavy equipment can be loaded into trucks with a minimum of difficulty.

Plant Performance

Tuning up of the plant started Feb. 1, 1949, and the kiln was first fired on Feb. 7. After completing early operating tests and correcting several minor installation faults, the kiln was started for actual production on Mar. 23. But after a few days considerable vibration developed in the centrifugal filter, and a shutdown was necessary on April 6th. Korfund vibration snubber pads were installed under the filter, and other improvements were made, and the plant started again on April 13. It has been operating and performing satisfactorily since then.

To date, fuel consumption has averaged 53 gallons per ton in the main kiln burner when operating at capacity of 60 tons, or better. Approximately four gallons of fuel oil per hour are burned in the auxiliary boiler to make steam for heating the Bunker "C" oil. The total is 57 gallons as against a 60 gallon guarantee.

Construction and Operating Costs

The total construction cost, including all engineering, was $785,-267.

A full month of steady operation was first attained in May, when 1348 tons of lime were produced, and by the end of October 1949 the plant had turned out 9,620 tons of lime averaging 92 per cent calcium oxide.

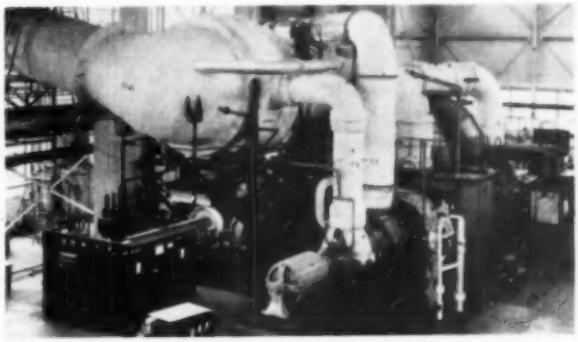
Gross operating costs during the six months from May 1 through October 31 were $58,008, or $7.79 per ton of lime produced. During the six months the Department received $4,466 for lime shipped to other municipalities, and the net cost per ton of lime used in the softening plant became $7.62. No interest or amortization costs are included in the above figures.

Construction of the project was under the direct charge of the author, reporting to Mr. W. A. Glass, Director of the Department of Water and Sewers. The planning and detailed design of the plant was done by Lime Industry Management and Engineering of Hershey, Penna. The kiln and other major items of equipment were supplied by F. L. Smidth & Co., of New York City, while the general construction work was handled by Fred Howland, Inc., of Miami, Fla.

Gas Turbine Operates at 1500 F

Successful operation with inlet gas temperatures of 1,500 F has been accomplished in tests on the Allis-Chalmers gas turbine at Annapolis, the U. S. Navy and the Allis-Chalmers Manufacturing Company have revealed. This turbine unit is the first to be designed for long-time service with operating temperatures as high as 1,500 F, according to Allis-Chalmers engineers.

Installed at the U. S. Naval Engineering Experiment Station in 1944, the elements of this gas turbine unit have since been operated in more than 3,000 turbine-hours of rigorous testing, and have been started and stopped more than 400 times. Successful operation of the unit at 1,350 F was revealed in 1946, and subsequent tests have included operation for some length of time at temperatures ranging up to 1,524 F, this latest announcement reveals.



Feedwater Analysis and Treatment

A Study Course for Power Plant Chemists and Operators

THESE questions and answers were prepared to help the men in the plants of Florida Power Corporation to better understand the need for and effect of feedwater analysis and treatment procedures which have been adopted for their operations. While the information presented here is specifically prepared to suit that company's conditions and practices, most of it is of general nature and adaptable to any plant. And those items that are not general, can serve as case illustrations, subject to the variations needed to match the reader's individual plant requirements.

By R. B. Lee
Production Engineer
Florida Power Corporation
St. Petersburg, Florida

. . . . . PART ONE . . . . . .

1—With condensate piped to laboratory, would it be advisable to have a large storage bottle? Why?

It is advisable to use a large Pyrex bottle for distilled water instead of using it direct from the condenser. The hot well temperatures approach 110 degrees F in the summer and this will affect some tests. This bottle must be stoppered at all times with two-hole stopper, one hole being open to atmosphere.

2—How much distilled water should be added to dilute 1,000 milliliters of concentrated hydrochloric acid to .10 normal? How could this be checked?

Concentrated hydrochloric acid (35% HCl) is chemically pure acid, having a specific gravity of 1.19 and a molecular weight of 36.47. A 1.0 normal solution is made by dissolving (1 gram molecular weight ÷ total valence of metallic radical) of HCl in water and diluting to 1000 milliliters.

Therefore, since the valence of hydrogen radical is 1, a normal solution of HCl $= \frac{36.47}{1}$ grams of HCl diluted to 1000 ml.

Volume of HCl $= \frac{\text{weight (grams)}}{\text{specific gravity}} = \frac{36.47}{1.19} =$ 36.65 ml.

Since 33% HCl is available, $\frac{30.65}{0.35} = 87.5$ ml is required for a 1N solution.

Therefore, 87.5 ml concentrated HCl in 1000 ml solution with distilled water would give a 1N solution and 1000 — 87.5 = 912.5 ml distilled water would be required for 87.5 ml concentrated acid.

For 1000 ml concentrated acid, $\frac{1000}{87.5} \times 912.5 =$ 10,426 ml of distilled water would be required.

For a 0.1N solution, the volume would be increased 10 times or a total volume of $10 \times \frac{1000}{87.5} \times 1000 = 114{,}280$ ml solution. Total distilled water added = 114,280 — 1000 = 113,280 ml or 113.28 liters.

The normality of the resultant solution can be checked by titrating the acid solution with sodium hydroxide solution of known normality. If a solution of 0.1N sodium hydroxide is available, equal amounts should be required for neutralizing.

3—Why is bromine water used in boiler sample when determining silica concentration with tests using color comparator standards?

Saturated bromine water is used in the silica test to oxidize sodium sulphite that is present in the boiler waters and thereby eliminate the development of a green color which interferes when comparison is made with the standards.

4—Why should sodium sulphate concentration in boiler water be kept at the right value to give the correct ratio of sulphate to alkalinity?

Maintaining sodium sulphate concentration required to give a specified ratio between sulphate and alkalinity, depending on operating pressure, is one of the requirements set up by the ASME to eliminate intercrystalline cracking. Some consulting chemists contend that this is not a safeguard, but the present available information has not definitely proved that this is true.

5—What will be the effect of maintaining the sulphate-alkalinity ratios higher than required for the pressure at which the boiler operates?

Any sulphate concentration above that required for the desired sulphate-alkalinity ratio increases total concentration in boiler water. Since a high concentration will cause carry-over of solids in steam, it is desirable to carry the minimum total concentra-

tion and still provide the necessary chemicals for good water conditioning.

6—Why is methyl orange alkalinity corrected for phosphate concentration in boiler water?

Methyl orange alkalinity is corrected for phosphate present, mainly to regulate the corrected alkalinity-sodium sulphate ratios—because phosphate is not considered to be a contributor to caustic embrittlement.

7—Why should water to a zeolite softener using green sand have a pH below 8.0?

Water having a pH above 8.0 will tend to break down some forms of zeolite.

8—Why is it better to pump chemicals to a boiler drum in a diluted solution at a high rate than a strong solution at a low rate?

It is known that chemicals fed to the drums of some types of boilers are not distributed evenly through the boiler water. If the chemicals are in a strong solution, there is more chance of this occurring. Also there is more chance of a high total concentration of chemicals being localized and a tendency for carry-over at this section of the drum might be produced.

9—Why is sodium sulfite supplied to the feedwater and does it remain as such, or does it undergo any chemical change?

Sodium sulphite will combine with any oxygen present in feedwater. This chemical action changes it to sodium sulphate.

10—Why do we normally pump sulphate, caustic and phosphate direct to boiler drum instead of deaerator?

Sodium sulphate, caustic soda and phosphate are pumped directly into the boiler drums instead of the deaerator heater or feed lines to eliminate the possibility of precipitating any materials from the water that would tend to plug feed lines or water level regulator valves. By so doing, it is also possible to re-establish proper concentrations within the boilers shortly after extensive blowdown.

11—Why is a pH of 8.6 maintained in the deaerator?

Research laboratories have found that the point of minimum solubility of iron in distilled water occurs at a pH of 9.6. It has also been determined that dissolved oxygen will be less effective as a corroding agent under alkaline conditions than in neutral or acidic waters. However, copper bearing metals are attached by waters having a pH above 9.0. A pH of 8.6 is therefore set as the desired control point for minimum corrosion.

12—What is pH and what is the relationship between a pH of 4.0 and a pH of 6.0?

The term pH is the logarithm of the reciprocal of the hydrogen ion concentration. Pure water has a pH of 7. In terms of the above definition pure water ionizes to produce hydrogen or acid ions (H^+) in the amount of 0.0000001 grams per liter. This can be written as 1×10^{-7}. For convenience, the exponent is taken as the pH value, namely 7. A solution having a pH of 4.0 is 100 times more acid than one having a pH of 6.0.

13—Why is alkalinity important if disodium phosphate is used as a secondary or internal treatment in the boiler or evaporator?

To completely precipitate any hardness forming materials from boiler waters with phosphate salts, it is necessary to have the required amount of alkalinity present so that the precipitate can be formed as tricalcium phosphate. If this is not done, a calcium acid phosphate or possibly a monocalcium phosphate can be formed which would not fully precipitate from the water. It is advisable to maintain an alkalinity equivalent to a pH of at least 10.6 so that the proper reaction will take place.

14—Why is it necessary to use phosphate salts in treatment of boiler or evaporator salines, the latter not being subjected to preliminary treatment?

There is nearly always some chemical in water which without treatment will form a hard scale when subjected to heat. By maintaining phosphate residuals, this hard scale will be eliminated, since the phosphate will react with these scale forming elements and form a soft deposit or sludge which may be blown out.

15—Why is the water in a deaerating heater maintained above the boiling point corresponding to atmospheric pressure?

If water is allowed to stand below boiling point, it will absorb gases from the atmosphere. By boiling, gases (CO_2 and O_2) are driven out of the water. The deaerator is operated at a slightly higher pressure than atmospheric to force these liberated gases out of the system.

16—What is the most important requirement for obtaining true results in a test?

The most important requirement for obtaining true results is cleanliness. No matter how accurate the tests are made, they depend on a true sample and testing chemicals. Any foreign matter in chemicals or sample will affect results.

17—Why is the elimination of ammonia from the feedwater system so important?

Ammonia will attack copper, placing it in solution as a copper ammonium ion. Since there is copper in condenser tubes, heat exchangers, and some of the inter-after condensers, tube failure will result from the presence of ammonia. It also affects conductivity readings and may indicate higher solid concentration in steam or water than is actually present.

18—What is accepted as the percentage of silica carried over from boiler water?

It has been determined that silica in boiler water

vaporizes and is carried over in steam by selective entrainment. This carryover is usually in the neighborhood of 1% of the concentration in the boiler.

19—Why are such low limits put on silica concentration in boiler water?

Some of the silica carryover in the steam deposits on the turbine blading. Temperatures have an effect on the structure and amount of this deposit. A silica deposit on turbine blades cannot usually be washed off—it is necessary to sand blast it with fly ash or carborundum dust.

20—If your supply of disodium phosphate was depleted, but trisodium phosphate was available, how much trisodium phosphate should be used to replace a requirement of 2 pounds of disodium phosphate? What other condition would the use of trisodium phosphate affect?

The phosphate radical (PO_4) in disodium phosphate (Na_2HPO_4) is 67%. The phosphate radical in trisodium phosphate ($Na_3PO_4 \cdot H_2O$) is 52¼%. The amount of trisodium phosphate would be $\frac{.67}{.52\frac{1}{4}} \times 2 = 2.56$ pounds. Trisodium phosphate increases pH more than disodium phosphate.

21—Why should there be less carryover in vapor from an evaporator when operated with a shell pressure of 35 pounds gage instead of 3 pound gage, assuming output is the same under both conditions?

The specific volume of steam at 35 pounds G is 8.5 cu ft lb while at 3 pounds G, it is 23 cu ft/lb. It can be seen that the velocity of a certain weight of steam at the higher specific volume of 3 pounds pressure will be almost 3 times higher than at 35 pounds G pressure. Since there is more tendency for carryover of water by steam at high velocities, there would be less chance of carryover with the lower specific volume at 35 pounds G pressure.

22—Why will scale inside a boiler tube cause the tube to fail?

Scale inside a boiler tube will insulate the metal from the water. Since scale has a very low heat transfer rate, the metal covered by the scale will approach the outside gas temperature. This is usually high enough to cause tubes to fail.

Section 2 of these questions and answers on feedwater treatment will follow—in the March issue.

New Fire Extinguisher Material from Soya Bean Base

THE AUTOMATIC SPRINKLER CORPORATION OF AMERICA, Youngstown, 1, Ohio, has announced "Automatic" AER-O-FOAM fire protection. The new material, produced from a soya bean base, is said to be considerably more adaptable to simplified system design than a chemically formed blanket of carbon dioxide.

When mixed 6 per cent by volume with water and aerated, the material forms a homogeneous tenacious foam blanket capable of flowing around obstacles and quickly extinguishing fires involving gasoline, benzol, naptha, etc.

Illustrations show progressive coverage tests at a synthetic resin and insulation varnish plant. System is entirely automatic, establishes immediate protection over that area which would be involved in fire, and prevents flashback of fire for several hours.

Manufacturer points out that the development and application of this system makes possible a more positive method of fire extinguishment for hazards familiar to chemical and petroleum processing, paint and varnish manufacture, electric power generation and other industries storing and handling flammable liquids.

AUTOMATIC'S AER-O-FOAM COVERAGE ON THIS INSTALLATION IS ABOUT 2-IN. OF DEPTH PER MINUTE. OPERATIONAL PHOTOS SHOW THE CONTROL AND ISOLATION OF A SPILL FIRE WHICH MIGHT OCCUR AT TANK CAR UNLOADING LOCATIONS OF THIS SYNTHETIC RESIN AND INSULATING VARNISH PLANT. THE REMOVAL OF THE FOAM BLANKET WAS AMAZINGLY SIMPLE, SINCE THE FOAM DEHYDRATED WITHIN A FEW HOURS.

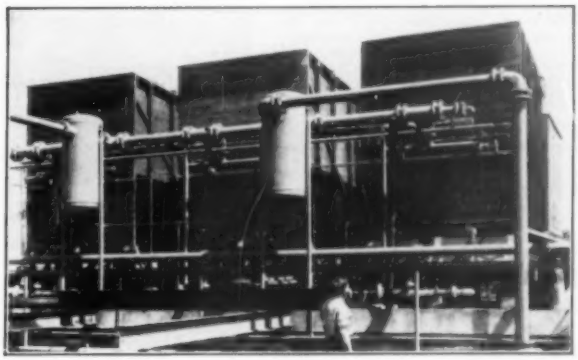
18 SECONDS.

2 MINUTES.

3 MINUTES.

Virginia Plant Installs Big Freezer

By Terry Mitchell
Frick Company
Waynesboro, Penna.



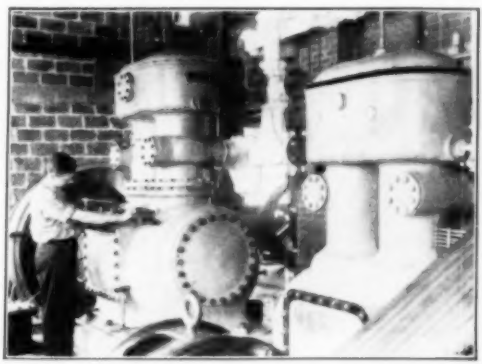
THREE EVAPORATIVE CONDENSERS SAVE WATER, KEEP THE HEAD PRESSURE LOW.

CASSCO Corporation and its wholly owned subsidiaries, Cassco Berkeley Corporation, Northern Virginia Ice Corporation, Cassco Warren Corporation, and Cassco Refrigerating Corporation, own and operate ice plants and stations at twenty locations in the State of Virginia, and one in West Virginia.

Cassco Refrigerating Corporation has an ice and locker plant at Luray, Virginia, with a capacity of 15 tons of ice daily and 300 frozen food lockers. It also has ice stations at Elkton and Shenandoah, Virginia. Its other, and largest, plant is at Harrisonburg, Virginia, having a capacity of 45 tons of ice daily, 264,000 cubic feet of cooler storage space, plus complete facilities for rapid icing of railroad cars and trucks. This corporation has just recently constructed and put into operation a modern quick-freezing and low-temperature storage addition to the Harrisonburg plant.

The building is 107 feet long, 64 feet wide, and four stories in height. Freezer storage space, held at minus 10 F., totals 200,000 cubic feet. It is equipped with a blast tunnel, having a quick freezing capacity of 50,000 pounds of products daily, which is located in the middle of the third-floor freezer storage room. Rock cork insulation is used. The coils and fans are on a deck above the steel beams. The louvres at the sides of the tunnel are adjustable.

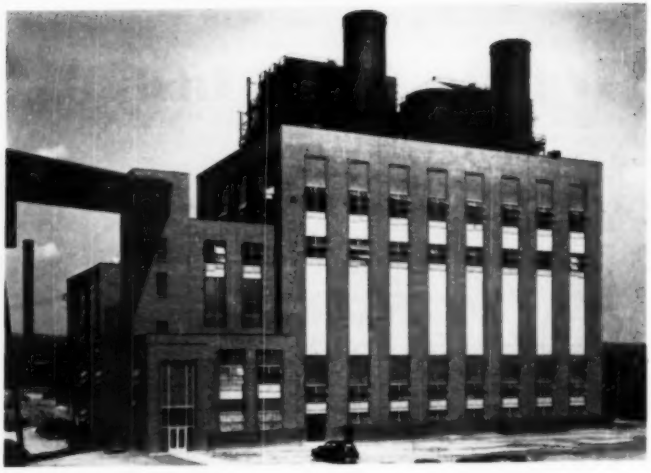
The entire plant is served by three 9 by 9 compressors, a 10 by 10, a 12 by 12, a 7½ by 7½, plus a 7¾ by 5 booster and an 11½ by 8. These boosters are in the new addition. The 12 by 12 was moved into the plant a short time ago, having been acquired from Standard Ice Company in Lynchburg, Virginia, more than 20 years ago, and has stood in storage for over 10 years. Both the compressor and its driving motor were rebuilt. This motor is of 100 hp, turns 180 rpm, and was built by the Electric Machinery Company. The compressor, originally built in 1924, is an example of the enduring worth of Frick equipment.



AT THE LEFT, TWO OF THE FIVE FRICK AMMONIA COMPRESSORS. BELOW, NEW QUICK-FREEZING TUNNEL. COILS AND FANS ARE OVERHEAD.

By

F. E. HALE, Principal Structural Design Engineer; J. A. McLENNAN, Principal Mecanical Design Engineer; A. MERGENTHALER, Principal Electrical Design Engineer; and edited and coordinated by E. C. GASTON, Chief Design Engineer — all of SOUTHERN SERVICES, INC., Birmingham, Alabama.



Alabama Power Company's New Gadsden Steam Plant

Designed for ultimate capacity of 240,000 kw, Alabama Power's newest plant, near Gadsden, Alabama, has two 60,000 kw units now in operation.

THE new Gadsden Steam Plant of Alabama Power Company is located on the left bank of Coosa River at East Gadsden, Alabama. The first installation of 120,000 kw capacity consists of two units with a nameplate rating of 60,000 kw each, 850 psi, 900 F design, with firing by natural gas or pulverized coal. Provision is made for two additional units of like capacity. Construction of this plant was started in July, 1947, and the initial unit went into operation in April of 1949, the second unit following in July, 1949.

Several factors entered into the selection of the Gadsden site for the large capacity steam plant. Among these may be mentioned the rapid industrial growth of Gadsden and vicinity which is among the fastest growing and developing areas in the territory served by the Company. Another important factor is the location of Gadsden in reference to the distribution and load centers of the interconnected system. From a structural consideration, the abundance of condensing cooling water, satisfactory rock foundations, accessibility of railroad and highway connections made this site extremely desirable. Still another factor was the existence of the low pressure Gadsden Steam Plant of the Alabama Power Company built in 1913, which had a transmission system connection and substation already in operation which could be converted and enlarged to accommodate the requirements of the new plant.

Building Design

The main building completely houses the boilers and turbo-generators with their auxiliary equipment. The front portion of the building, known as the Office Annex, 95 ft x 48 ft in size, houses the administration offices, wash and locker rooms, laboratories, assembly room, and machine shop. The main power house building and the office annex cover approximately 30,300 sq ft. This combined structure, of structural steel and brick, rests on a concrete base slab 5 ft thick which, in turn, is supported on a shale with brecciated limestone rock. Fortunately, the underlying rock formation was satisfactory at levels which permitted pouring design slabs direct on the rock with minimum of concrete fill.

The power house is built with solid 12 in. brick walls, using darker shade brick around window openings. The window panels consist of a combination of glass block and canopy type steel sash with cast aluminum spandrel sections which emphasize the vertical line construction. The temporary end of power house is constructed of Galbestos siding.

The generator room roof is constructed of precast concrete roof

slabs covered by tar and gravel roof. The generator floor is covered with quarry tile bordered by glazed tile wainscot. The offices, wash and locker rooms, first-aid room and laboratory area is provided with summer and winter air conditioning. The locker and wash rooms are finished with ceramic tile floors and glazed tile walls. Each employee is provided with an individual locker, ventilated by a power exhaust system.

The offices have plastered walls, acoustical ceilings, and recessed fluorescent lighting. The laboratory is provided with steel cabinets and fixtures with special ventilating system. On the second floor of the administration building the foreman's offices and superintendent's offices are so located as to overlook the generator room through large windows, double glazed for sound proofing. The front entrance motif is designed with glass block, structural glazed facing and aluminum trim and doors.

The main power house substructure walls are of cantilever type 40 ft high above base slab. These walls are stepped construction, using base slab as toe and heel portion of cantilever wall. The floor is constructed either of reinforced concrete or steel grating, depending upon its use. The turbine foundations are of reinforced concrete built in two pours, each foundation consisting of approximately 640 cu yd of concrete and 65 tons of reinforcing steel.

The power house steel frame is of conventional design comprising approximately 2300 tons of steel of which a large portion is of wide flange sections. The coal bunkers have a capacity of approximately 950 tons of coal per unit.

Condensing Water Structures

The condensing circulating water system is constructed throughout with reinforced concrete water passages. The intake structure, designed for four units, is placed on the bank of Coosa River and is equipped with traveling water screeens, trash racks, and stop logs. The intake water passage is 14 ft wide by 9 ft high, and the discharge water passage is 13 ft wide by 10 ft high. The discharge water passage is constructed on the outside face of cantilever substructure wall for some distance and then angles downstream approximately 350 ft below intake structure to prevent recirculation .

Between the intake structure and river wall of power house, the banks are protected by precast concrete cribbing filled with slag, supplemented by additional rock bank protection. An earth dike was constructed to protect the intake structure during construction which also served as a cofferdam for the general power house construction.

The main power transformers are supported on concrete columns resting on the walls of the discharge tunnel and connected to the downstream wall of the power house.

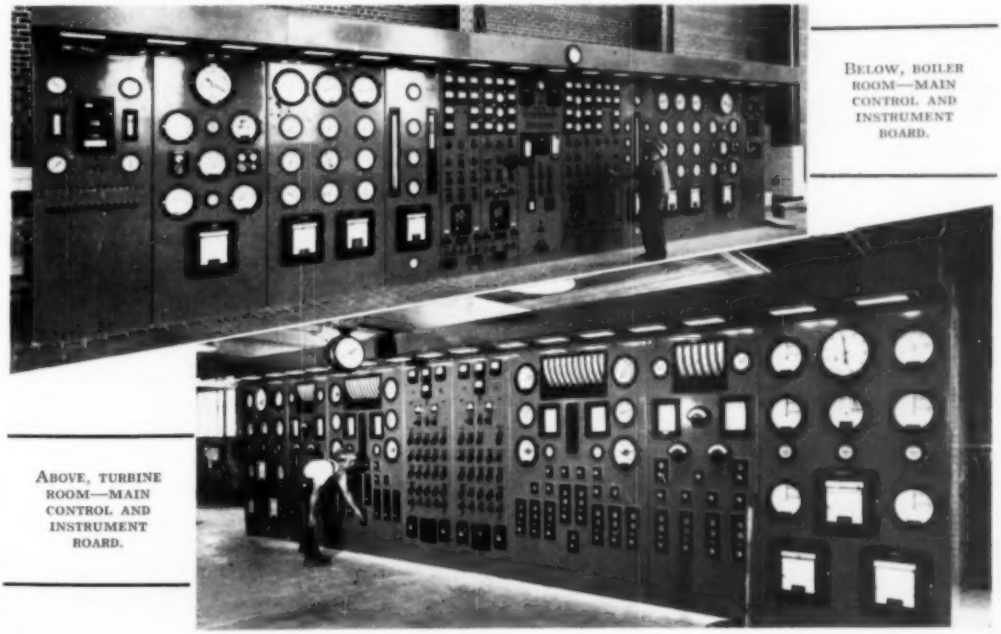
Quantities

Some of the quantities involved in the main structures were approximately as follows:

Excavation	Earth 87,000 cu yds Rock 33,000 cu yds
Concrete in Power House and Coal Handling Structures	20,000 cu yds
Structural Steel in Power House	2,300 tons
Brick in Power House	1,700,000
Steel Floor Grating	31,000 sq ft

Turbo-Generators

Two 60,000 kw, .96 P.F., tandem compound, double flow, 3600 rpm turbine-generator sets are in-



BELOW, BOILER ROOM—MAIN CONTROL AND INSTRUMENT BOARD.

ABOVE, TURBINE ROOM—MAIN CONTROL AND INSTRUMENT BOARD.

stalled. The units are in line, and arranged with the turbine ends of the machines facing each other. The control board is located between the units to centralize turbine control. The first unit placed in operation was manufactured by the General Electric Company and the second unit was manufactured by the Westinghouse Electric Corporation. The units are designed for the same steam and exhaust conditions, that is, 850 psig, 900 F and 2" Hg back pressure. The turbines are bled at four points for feedwater heating and evaporation. The generators on both machines are rated 70,588 kva with 0.5 psi hydrogen pressure; with 15 psi hydrogen the capacity is increased 15 per cent. Each generator is equipped with direct connected exciter and pilot exciter. Power is generated at 13,800 v, 3 phase, 60 cycle.

The steam path of the Westinghouse turbine includes one impulse stage, twenty-two high pressure reaction stages, and six low pressure double flow reaction stages. The steam path of the General Electric turbine includes one impulse stage, sixteen high pressure Curtiss stages and four low pressure double flow Curtiss stages. That is, the Westinghouse unit has a total of twenty-nine stages and the General Electric turbine has a total of twenty-one stages.

Both units are equipped with turning gears, low vacuum trip devices and explosion diaphragms, single throttle valves and separate oil tanks. The oil tanks supplying lubricating and governor oil to the units are located on the floor beneath the operating floor, and in front of the turbine foundations. The main oil pumps are direct driven from the turbine shafts. The turbines are furnished with auxiliary steam turbine driven oil pumps. Both turbine-generators are five bearing machines.

Condensers and Auxiliaries

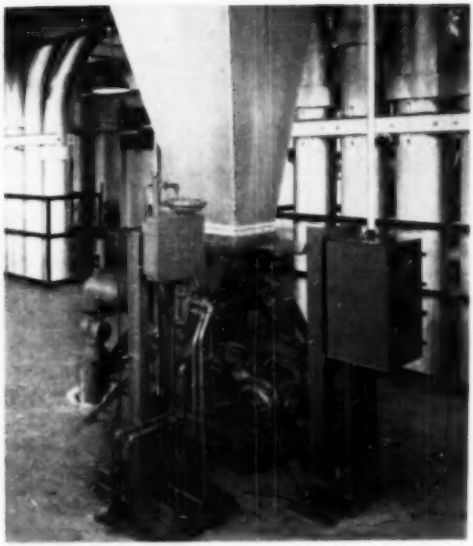
The turbines exhaust to 47,000 sq ft C. H. Wheeler Mfg. Co. condensers located directly underneath and, at right angles to the turbine shaft. The condensers are divided water box type, and arranged for reversing the flow through the tubes for clearing trash from the tube sheets and tube entries. The direction of flow is reversible and is controlled through motor integral slide valves located in the cooling water inlets and discharges. One of the condensers is spring mounted and unbalanced thrusts from the circulating water expansion joints are counteracted by hydraulic balancing drums. The second condenser is connected to the turbine through an expansion joint. The special treatment was dictated by the high resultant moments imposed on the turbine due to high flood water levels and the use of a divided water box.

The condenser hot well is of the deaerating type and gases are removed by duplex two stage jets. The hot well water level is maintained at a constant level by automatically by-passing part of the condensate from the feedwater heating cycle after passing through the inter and after condenser. This connection is also used for cooling the condensate circulated through the inter and after condenser during low load, and the starting up operation. The condenser connection is provided with a spray to allow subcooling the condensate by contact with the condenser tubes in order to allow placing the jets in operation early during the turbine start-up.

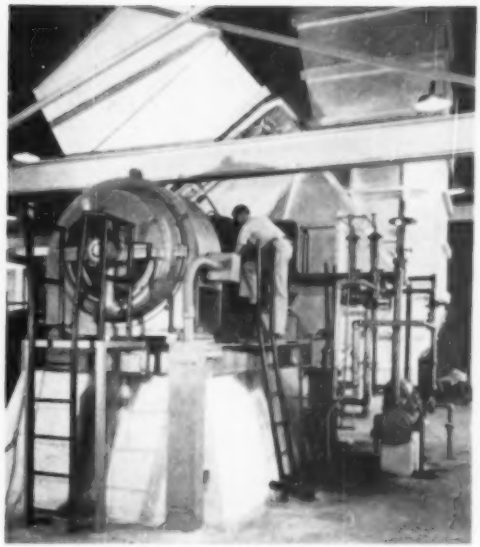
Two 1000 gpm horizontal three stage condensate pumps are furnished with each condenser. They are self regulating and have sufficient head to discharge through two low pressure heaters and against the pressure in the deaerating heater.

All points which will require priming are connected to a control header located in the condenser room and served by a single stage high capacity steam jet air pump. This jet is primarily used for ex-

TURBINE ROOM — WESTINGHOUSE UNIT FOREGROUND, GENERAL ELECTRIC UNIT BACKGROUND.



COMBUSTION CONTROL FOR PULVERIZED COAL FEEDER.



TOP FLOOR BOILER ROOM, VIEW OF DRAFT FANS.

hausting air from the condenser steam space when the condenser is being prepared for the turbine start-up.

The circulating water enters the plant (after passing through three 60,000 gpm vertical traveling water screens) through 2 rectangular concrete tunnels located underneath the condenser room floor. The circulating water pumps are 29,500 gpm capacity each and there are two per condenser. Cut-off valves are provided between the circulating water pumps and the intake tunnel. The water passes through the condenser and back to a discharge tunnel through a 27 ft syphon. The circulating water is discharged back to the river at a point 350 ft downstream from the intake structure.

Turbo-Generator Auxiliaries

The lubrication and governor oil is conditioned by continuously circulating 18 gpm through combination precipitation and filtration units. One unit is provided for each turbine and they are centrally located on the basement floor slab. One 9,000 gallon oil storage tank with the necessary transfer pumps is installed. Cartridge type actuated earth filters are located adjacent to the main oil condition units for acidity control. These cartridge filters are normally not in operation, but if necessary part of the oil can be circulated through them.

Water for Coolers

Cooling water for the oil and hydrogen coolers is supplied by 1300 gpm cooling water pumps located in the condenser room. Standby cooling water is from the house service water system through a reducing valve. The house service water system provides general cooling water, wash water, boiler make-up water, and other plant services. This service is raw untreated river water. There are three 1000 gpm house service water pumps, and one 30,000 gallon house service water tank. The water pumps are located over the circulating water tunnel and are arranged for control by the condenser operator.

Steam Generators

Two 600,000 lb/hr tangentially fired three drum, bent tube, Combustion Engineering-Superheater radiant type steam generating units supply steam to the turbines. The two units are similar in all respects but are opposite hand. The steam conditions are 875 psig and 860 F at the superheater outlet. The design pressure is 975 psi. Each boiler is direct connected to one turbine, but the connections are "crossed-over" to provide maximum plant reliability. All cross-over connections are double valved. The furnace walls are water cooled by tangential tubes on the front and sides and by finned roof tubes. The water wall area is 9789 sq ft. The furnaces are corner fired by tangential burners which can be tilted to control superheat and furnace slagging. The burners are suitable for either pulverized coal or natural gas fuel, fired either separately or in combination. The generators are equipped with Elesco seven loop split type superheaters. The surface of the low temperature stage is 12,250 sq ft and the surface of the high temperature stage is 1,415 sq ft. The tube metal in the high temperature stage is chrome molybdenum, titanium stabilized. Superheat is maintained constant between loads of 360,000 lb/hr and 600,000 lb/hr by manually positioning bypass dampers and by positioning the burners in a vertical direction. The boilers are also furnished with Elesco continuous loop, horizontal fin tube, parallel flow, economizers. The surface of the economizer is 17,100 sq

ft. Each unit is equipped with two Ljungstrum, regenerative, 63,000 sq ft air preheaters.

The furnace bottom is of the dry refractory type, arranged for air ventilation, and water jet removal of ash. The ash is sluiced to an ash sump located between the present two units and the two units to be installed in the future. Ash is pumped by two pumps in series to the disposal area across the river. Complete standby pumping and duplicate ash disposal piping is provided. The ash piping inside the building is Ashcolite while the pipe outside the building is cast iron mechanical joint piping. The mechanical joint pipe is laid across the river on the river bed without trenching or the use of stream anchors. Soot hoppers are emptied through the use of hydrovactors and manually operated wind swept valves. The hydrovactors discharge to the ash sump. The pulverizers are equipped with tramp iron hoppers and air swept pans through which the tramp iron is discharged to a vacuum tank. The tramp iron is gradually fed into the sump hopper during the ash sluicing operation to obviate the tendency of the heavy particles to settle out in the invert syphon under the river.

Boiler Auxiliaries

The forced and induced draft fans are located on the top floor of the boiler room. The fan speed is regulated by continuous running oil pump hydraulic couplings. The induced draft fan has a capacity of 350,000 cfm of gas at 375 F and a static pressure of 13.0 inches of water when operating at 690 rpm. The forced draft fan has a capacity of 210,000 cfm of air at 100 F and a static pressure of 11.0 inches of water when operating at 870 rpm. The induced draft fans discharge through the roof to stub stacks. An electrostatic precipitator is installed on the roof for removal of fly ash. The ash hoppers are discharged through wind swept valves and Ashcolite piping to the hydrovactor system.

Coal is fed to the pulverizers from a 1900 ton capacity (two boilers) continuous coal bunker. All crushed coal is weighed by automatic batch scales. The coal pipes are essentially vertical to reduce coal stoppage to a minimum and hoppers are provided with electric vibrators.

Variable speed feeders located on the operating floor feed the mills. Each boiler is provided with three Raymond bowl mills each having a maximum capacity of 20,800 pounds of coal per hour. The mills are center fed and have integral exhausters. Hot air is supplied to the mill bowl with the incoming coal for partial drying.

A high pressure gas reducing station is located near the plant site which reduces the natural gas line pressure to approximately 35 psig. In order to assure close control a Fisher reducing valve, equipped with a valve positioner, reduces the pressure further, to a controlled pressure of 20 psig. The lead to each boiler is provided with a cylinder operated plug cock. The position of the cock is manually controlled from the gauge board. It is also arranged to close automatically in the event the gas pressure drops below 5 psig or rises above 35 psig, to protect the furnace against gas explosions. The rate of gas flow to each boiler is regulated by a Hagan butterfly valve controlled from the combustion control system.

The soot blowers are manually operated and use high pressure steam for cleaning the component parts of the unit except the air heater. The steam for the air heater blowers is reduced in pressure by passing through an orifice. Six retractable blowers are installed per boiler in the furnace roof for blowing screen tubes. Wall boxes are provided to facilitate the addition of furnace wall blowers in the event they are justified by operating experience. One Diamond Bi-Color water column is installed on each boiler and in the common aisle between Units 1 and 2, so that the mirrors can be viewed from the boiler board. The outside ends of the drums are equipped with Reliance water columns arranged to be viewed directly from the drum floor, and indirectly through a remote column mounted on the boiler control board.

Starting System and Controls

The boiler may be brought up to full operation through the use of four mechanical atomizing oil burners which have a capacity of 142 gpm of number 3 oil at 250 psi. The oil is supplied from 3 gear type pumps located in a separate small building at a distance from the boiler room. Three 15,000 gallon horizontal tanks are provided for "Lighter Oil Storage". The tanks are readily accessible to either highway or railroad tank car delivery. Chemical feeding is by the batch method from 1.56 gpm horizontal duplex pumps conveniently located on the operating floor. The chemicals are mixed in one of three 50 gallon tanks each of which are provided with manual agitators.

The boiler control board is located on the operating floor, in the aisle between Units 1 and 2, and in front of the boilers and pulverizer feeders. The boards are of the cubicle type and parallel the boiler room outside building wall. Stairs are located near the control board for quick access to the coal scales and the pulverizers.

The control board is made up of one electrical panel, one recorder panel, and two combustion control panels per boiler. All panels are joined together to form one continuous board for the two boilers. The boards are rubber mounted to reduce vibration, are gray in color, and lighted from a lighting canopy built integrally with the board. The mechanical panels are ¼" thick and the electrical panels 3/16" thick. The total length of the control board is 33'-4" and the overall height of the board is 8'-9".

The boilers are equipped with pneumatic control, oil cylinder powered combustion control systems. The air for the control is supplied from the plant control air system which has a total capacity of 100 cfm, and the oil required is supplied from duplex oil pumps. To protect against loss of oil pressure due to the failure of the oil pumps, an air-oil pressure tank is located on the top floor of the boiler room. This tank has sufficient air and oil capacity to operate all power cylinders through three complete cycles.

The system receives its initial impulse from the main steam line through the master controller which establishes a pneumatic

loading pressure proportional to boiler load. The loading pressure is transmitted to the variable speed coal feeders, and to the gas flow valve when burning gas in combination with coal. This pressure is also transmitted to the air flow regulator. A corrector regulator provides means for maintaining the proper steam flow air flow relationship. A steam flow-air flow adjuster is provided on the boiler panel for manually adjusting this ratio. Biasing valves and manual controls are located on the control boards.

Air flow and furnace pressure are regulated by hydraulic coupling speed, but fan damper controls are provided for use at extremely low loads, when the fan speed would be reduced below 30% of the motor drive speed. Air flow regulator controls the forced draft fan, and a furnace pressure regulator controls the induced draft fan speed by adjusting the rate of oil input to or discharge from the respective hydraulic couplings. The couplings for Unit No. 1 are controlled through diaphragm valves located close to the coupling manifold connections while the Unit No. 2 couplings are controlled through one four-port rotary valve located several feet from the coupling manifold.

For air flow measurements, the pressure drop across the air side of one air preheater (per boiler) has proven satisfactory since the relative air flow through the two air preheaters remains relatively constant. Mill temperatures are controlled by the manipulation of hand operated butterfly dampers.

Feedwater System

Each boiler is fed by a single 1455 gpm, 3550 rpm, 6 stage horizontally split casing, centrifugal Ingersoll-Rand pump. The impellers, diffusers, casings and glands are 5.5% chrome, .5% molybdenum steel. The impeller rings are 5% chrome, .5% molybdenum steel. A complete stand-by pump is provided for each boiler and all four pumps are cross-connected with double-valving between the Unit No. 1 and Unit No. 2 systems. The pumps are furnished with Republic automatic minimum flow hand reset valves. These valves open when the flow through the pump is 150 gpm or less and bypass this amount of water to the deaerating heater. The boiler feed pumps are oiled from shaft driven gear pumps which also supply oil to the motor drivers. The boiler feed pumps operate at constant speed.

The feedwater regulator is located on the operating floor in a location readily accessible to the boiler operator, but is arranged for manual operation during emergencies from the boiler control board. The valve control is pneumatic, single element, and it is hydraulic oil cylinder operated. The mechanism is arranged to lock in position on failure of the operating medium. The feedwater regulator by-pass is a hand operated regulating valve similar in design to the Republic feedwater regulator and is also of Republic manufacture. Both valves have chrome molybdenum bodies.

All auxiliaries are motor driven and the steam for all heating is extracted from four turbine bleed points, and from the exhaust from the condenser air ejectors. The condensate is pumped through the inter and after condenser and two low pressure heaters to the deaerating heater. The latter is located on the top floor of the boiler room and discharges the deaerated condensate to an integral 105,000 pound storage tank. The boiler feed pump suction is from the surge tank and the pump discharges to the boiler through one high pressure heater.

The make-up is either raw river water or city water which is passed through a small preheating deaerator and pumped to the evaporator. The evaporated water is condensed in the main deaerating heater. Reserve condensate is stored in a 67,000 gallon concrete, steel lined, tank located below the boiler room basement. Excess condensate is returned to storage from the condensate pump discharge or returned to the system through the condenser.

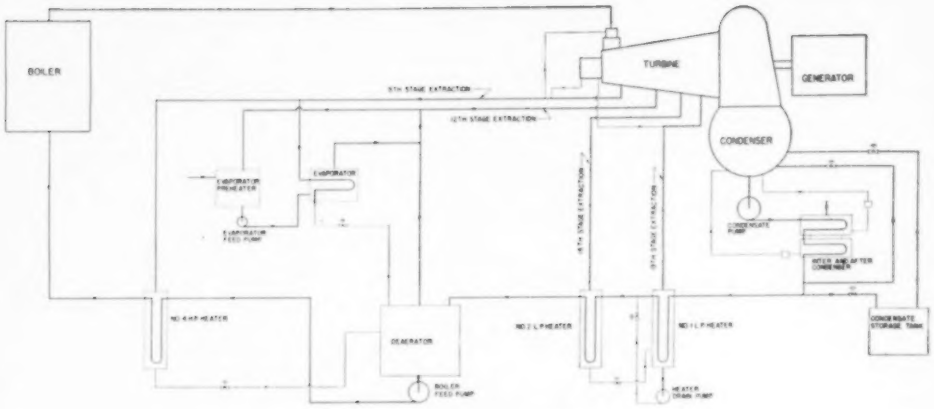
Provision is made for circulating water through the system after a shut down for removing air. To serve this purpose a Fisher reducing valve supplies live steam from the boiler to the deaerator at all times when the deaerator pressure is below 5 psig. This reducing valve is designed for operation on boiler pressures between 300 and 900 psig and reduces the pressure in one step.

Due to the difference in steam path there is a small difference in the heat balance for the two units, however the feedwater from either unit enters the boiler at about 360 F. At full load the drains from the high pressure heater are discharged to the deaerating heater and at low loads are discharged to the intermediate or second low pressure heater. The throw over is automatic and is necessary due to the relatively high static head. The drips from the intermediate pressure heater are discharged to the low pressure heater and those from the latter are pumped back to the condensate system on the discharge side of the heater. By-passes are provided to cascade all drips back to the condenser. All float chambers are of the torque tube type and drain valves are air operated. All valves controlling flashing mixtures have chrome-molybdenum bodies and stainless steel trim. Where possible drain valves are arranged to discharge direct to heaters in order to reduce pipe erosion to a minimum. All valves are equipped with throttle rate controllers to prevent hunting and water hammer.

Coal Handling System

Coal is delivered to the plant by rail in hopper bottom cars, and may be moved directly to the boiler room bunkers or stored for future or emergency use. Ground area is provided for the storage of 272,000 tons of coal, but this capacity can be increased in the event a larger storage capacity becomes necessary in the future.

The coal is unloaded into a 500 ton track hopper, after being weighed, and fed to the belt conveyor system by a 500 ton per hour plate feeder. The track hopper size was dictated by the possible future installation of a car dumper. At present a vibrating car shake out is provided to facilitate unloading coal. Coal is conveyed and elevated from the track hopper to a building which houses a 500 ton ring type crusher for reducing all



HEAT BALANCE FLOW DIAGRAM.

coal to minus 1". This building also houses transfer points which allow routing the coal to the boiler room bunkers or to storage. A self propelled tripper distributes the coal in the boiler room bunkers, which are located above the coal pulverizers. The coal is distributed over the coal storage area, and reclaimed from storage, through the use of bulldozers and tractor drawn scraper type carryalls. All coal is crushed before placing in storage and compacted under tractor traffic.

A 30 ton level capacity concrete hopper provided with a plate feeder is used for reclaiming coal. Plans call for a coal level of 40 feet over the top of the hopper. A belt conveyor carries the coal to the main coal bunker belt conveyor system.

All conveyor belts are 36" wide and have 3/16" top cover and 1/16" back cover. Belts handling uncrushed coal are provided with breaker strips. Idlers are cast iron and 6" diameter. A 48" diameter magnetic pulley removes tramp iron.

Generator Bus

The connections from the generator terminals to the transformers consist of unventilated square copper tubing indoors and round copper tubing outdoors. Part of the two indoor bus runs is contained in prefabricated metal enclosed 15 kv switchgear sections in which are also mounted the 4000 amp generator air circuit breakers, the instrument transformers and the station service transformers.

Transformers

Two banks of single phase power transformers have been provided, one for the power output of each generator. These transformers have full voltage insulation, are of the form fit tank construction, and are connected 13,200 v delta, 46,000 v wye, 115,000 v wye.

The HI and the XI terminals are arranged for Oil-O-Static cable connections. The upper portion of the two cable housings welded to each transformer tank is under normal oil pressure. One of these contains the 115 kv bushing and the other the 46 kv bushing which were provided by the Westinghouse Electric Corporation. The lower portion of the two cable housings and the high pressure seal were furnished by the Okonite Company.

The transformers are equipped with load tap changers to vary the voltage of the 26.5 kv winding from 90% to 110% of normal voltage in sixteen steps. All taps below 26.5 kv are reduced capacity.

Substation

The power is transmitted at 154 kv, 115 kv and 46 kv from a substation which was in existence before the construction of the power plant and which is located approximately 1000 ft from the new power house.

The two 115 kv and the two 46 kv connections from the power house to the substation are underground and consist of Oil-O-Static cables. The 115 kv cables have a cross section area of 400 mcm each and the 46 kw cables of 1250 mcm each.

The high tension oil circuit breakers in the existing substation have been replaced with breakers of a higher interrupting capacity.

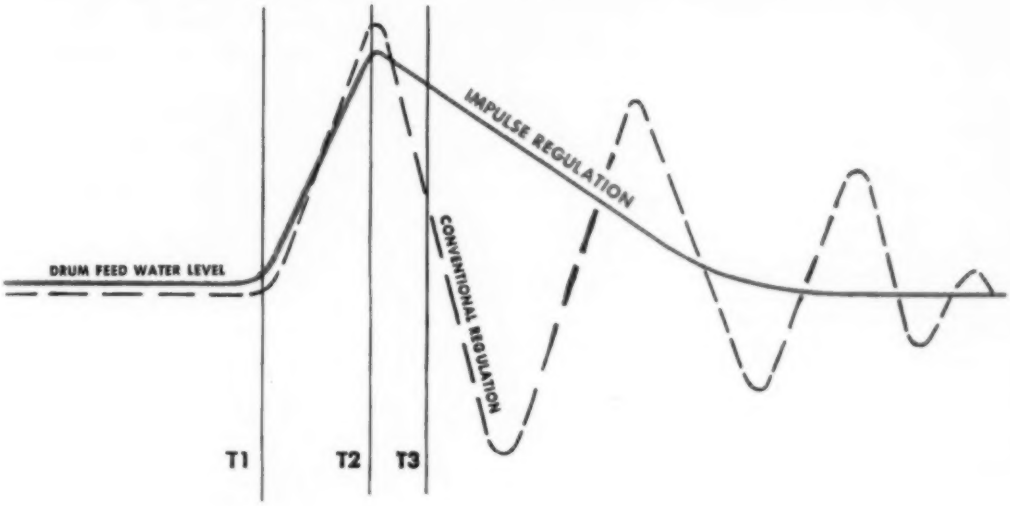
Station Service

The station service power is distributed at 2300 v, 575 v and 208 v. In general all motors rated above 100 hp are connected to the 2300 v station service system. Motors having a rating of less than 100 hp and more than 1 hp are connected to the 575 v bus. Motors of 1 hp and below are being supplied from the 208 v bus.

All station service switchgear consists of air circuit breakers installed in steel compartments. Two sections of 2300 v switchgear have been provided, one for each generating unit. These sections are of the fully metal enclosed type with the busses and all connections fully insulated. They are of the standard design with one main bus per section. The interrupting rating of the 2300 volt breakers is 100,000 kva.

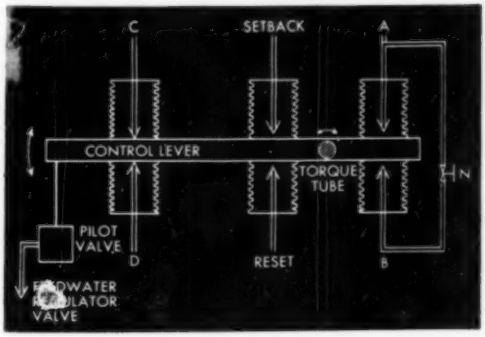
The 575 v switchgear consists of three sections; a main section for each of the two generating units and an essential section which is common to both units. The breakers in these groups have an interrupting rating of 25,000 amp and 15,000 amp. Several deviations

Control feed water level accurately during QUICK load change T_1T_2 with IMPULSE regulation

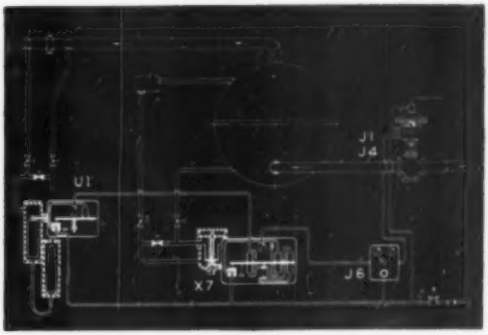


1 **COMPARE** that solid red line with the s-u-r-g-i-n-g feed water level represented by the dotted black line. Trouble is that conventional two-element systems, once adjusted for a given rate of change T_1T_2, merely react to magnitude of steam load without being able to compensate for a *different rate of change in load* T_1T_2. Since "shrink and swell" and resulting false drum level are functions of rate of change as well as magnitude of load, only Swartwout impulse regulation acts instantly and positively for *any rate of change in load* of any magnitude.

Swartwout
POWER PLANT EQUIPMENT



2 **DIFFERENTIAL LEVEL AND IMPULSE CONTROL** has setback bellows for wide throttling range and stability; reset bellows for constant level regardless of load. Bellows A, B and needle valve N, which comprise the impulse unit, convert air pressure proportional to load magnitude into an impulse reflecting *rate of change* as well as magnitude of load. This impulse cancels out drum "shrink and swell" effect (transmitted by torque tube) which is also based on rate of change and magnitude of load. Adjustment for varying water level with load is effected by bellows C, D if desired.



3 **SQUARE ROOT** of steam line orifice differential is taken by U1 flow transmitter which feeds air loading pressure proportional to steam flow into X7 differential level and impulse control. Regulating valve is equipped with J1 Positioneer and J4 air lock. J6 panel shows intermediate and manual pressures, provides for manual and automatic operation. In addition to this FW6 two-element impulse system, Swartwout also makes an FW7 three-element impulse feed water regulating system. Other types include the FW5 single-element system and SC (FW1) thermo-hydraulic system. A-0003

SEND FOR BULLETINS S-27, S-28-E. THE SWARTWOUT COMPANY, 18511 EUCLID AVENUE, CLEVELAND 12, OHIO

have been made from the standard construction. A clearance position has been provided for all 575 v breakers. In this position the main separable contacts as well as the control separable contacts are disconnected, the breakers can be locked in this position.

The coal handling switchgear section consists of four 2300 v breakers for the two incoming lines, for one crusher motor rated 250 hp and for the 2300/575 v transformer and thirteen 575 v breakers.

The 2300 v station service system is wye connected and grounded. Ground relays have been provided in addition to the overcurrent relays in order to prevent any ground fault from developing into a phase to phase fault on the large motors.

Electric Cables

The high voltage cables of the Oil-O-Static sections are paper insulated.

For the station service circuits and control circuits, both indoors and outdoors, insulation and covering have been selected which, based on our experience over a period of twelve years, are most suited for the service in the southern climate and which are resistant to chemicals present in the soil, concrete and air and which will require very little maintenance.

The following cables have been installed for such circuits:

a. 3000 v single conductor Okolite insulated cables with Okoprene covering for all 2300 v circuits in locations where the ambient temperature does not exceed 45 C.
b. 1000 v single conductor Okolite insulated cables with Okoprene covering for all 575 v circuits in locations where the ambient temperature does not exceed 45 C.
c. 600 v multi-conductor cables with Okolite insulation and Okoprene covering around the individual conductors and an Okoprene jacket over the multi-conductor assemblies for all control circuits in locations where the ambient temperature does not exceed 45 C.
d. 600 v single conductor cables with Okolite insulation and Okoprene covering for all lighting circuits in locations where the ambient temperature does not exceed 45 C.
e. In the areas of the boiler house where the ambient temperature exceeds 45 C, it was necessary to install asbestos-varnish cambric insulated, lead covered cables for the power, control and the lighting circuits.
f. All station service power cables are terminated without potheads.

Motors

The motors in the power house are of the open drip-proof construction.

The motors on the fan floor, where the ambient temperature is high, have Class B insulation. The other motors have Class A insulation, specially treated for boiler house service.

All coal handling motors, including the 250 hp crusher motor, are totally enclosed.

Fire Protection for Switchgear

Based on our experience with several large fires in metal enclosed switchgear and the difficulties encountered in extinguishing these fires, it was decided to install at this plant carbon dioxide fire protective equipment for the 13,800 v, the 2300 v, and the 575 v switchgear.

Three independent C-O-Two systems have been provided in the power house each consisting of the proper number of cylinders equipped for simultaneous release, piped to the individual switchgear compartments.

Principal Equipment

Gadsden Steam Plant — Alabama Power Company

TURBINE-GENERATORS

Turbine-Generators ..... One—General Electric Company, 60,000 kw capacity, 3600 rpm tandem compound, double flow 850 psig, 900 F, turbine direct connected to 70,588 kva, 13,800 volt, hydrogen cooled generator. One—Westinghouse Electric Corporation 60,000 kw capacity, 3600 rpm, tandem compound, double flow 850 psig, 900 F turbine, direct connected to 70,588 kva, 13,800 volt hydrogen cooled generator.

Main Exciters ..... One—General Electric Company 190 kw, 250 volt direct connected main exciter and 4 kw, 250 volt direct connected pilot exciter with hand operated rheostat. One—Westinghouse Electric Corporation 200 kw, 250 volt direct connected main exciter and 2.5 kw, 250 volt direct connected pilot exciter with hand operated rheostat.

CONDENSING EQUIPMENT

Surface Condensers ..... Two—C. H. Wheeler Manufacturing Company 47,000 sq ft divided cast iron water box, reverse flow two pass steel shell with 1600 gallons capacity hot well—1" Admiralty metal tubes.

Circulating Water Pumps... Four—C. H. Wheeler Manufacturing Company 29,500 gpm capacity horizontal, single stage, double suction 25 ft TDH.

Condensate Pumps ..... Four—C. H. Wheeler Manufacturing Company 1000 gpm capacity horizontal, three stage double suction 434 ft TDH.

Air Ejectors ..... Two—C. H. Wheeler Manufacturing Company Duplex, two stage with inter and after condenser.

Turbine Oil Purifiers ..... Two—S. F. Bowser and Company capacity 540 to 1000 gph with 18 gpm circulating oil pump.

Hydrogen and Oil Cooling Water Pumps ..... Two—Ingersoll-Rand Company single-stage, double suction, 1300 gpm, 800 ft total head.

STEAM GENERATING EQUIPMENT

Boilers ..... Two—Combustion Engineering-Superheater, Inc., 600,000 lb per hour at 875 psig and 860 F total temperature. Three drum bent tube. Boiler surface 1865 sq ft.

Superheaters ..... Two—Combustion Engineering-Superheater, Inc. (Elesco) Loop, split type, 13,665 sq ft surface. Outlet temperature control by-pass dampers. Temperature control range 360,000 to 600,000 lb per hour.

Furnaces ..... Two—Combustion Engineering-Superheater, Inc. completely water cooled, fin type roof tubes and tangentially spaced wall tubes.

Ash Hoppers ..... Two—Allen-Sherman-Hoff Company refractory type air ventilated with water jets and sluice ways.

Fly Ash and Tramp Iron Handling Systems ..... Two—Allen-Sherman-Hoff Company 4" Ashcolite pipe wind swept valves and fittings.

Ash Pumps ..... Four—Allen-Sherman-Hoff Company 6", 1000 gpm, 113 ft head.

Ash Sluice Water Pumps... Two—Ingersoll-Rand Company two stage, double suctions, 1500 gpm, 330 ft head.

Air Heaters ..... Four—Air Preheater Corporation regenerative, 63,000 sq ft.

Economizers ..... Two—Combustion Engineering-Superheater, Inc. (Elesco) continuous loop, split type, finned tubes, 15,000 sq ft surface.

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Pulverizers ..... Six—Combustion Engineering-Superheater, Inc. bowl mills with integral exhausters and variable speed feeders, capacity 20,800 lb coal per hour.

Burners ..... Twenty-four—Combustion Engineering-Superheater, Inc., tangential, combination gas and pulverized coal.

Soot Blowers ..... Two sets—Diamond Power Specialty Company, steam, manual operation.

Water Columns ..... Two—Diamond Power Specialty Company. Two—Reliance Gauge Glass Company.

Safety Valves ..... Manning, Maxwell and Moore (Consolidated).

Induced Draft Fans ..... Two—B. F. Sturtevant Company 350,000 cfm of gas at 375 F, 13.0 in water s.p. when operating at 690 rpm.

Forced Draft Fans ..... Two—B. F. Sturtevant Company 210,000 cfm of air at 100 F, 11.5" of water s.p. when operating at 870 rpm.

Hydraulic Couplings (Induced and Forced Draft Fan Drives) ..... Four—American Blower Company continuous running pump control—I.D. fans 48" coupling, F.D. fans 36" coupling—external coolers.

Fly Ash Precipitators ..... Two — Research Corporation Electrostatic, two units, each 300,000 cfm capacity.

Feedwater Controls ..... Two — Republic Flow Meter Company oil operated, single element, valve chrome-molybdenum body, direct cylinder operated.

Combustion Controls ..... Two—Republic Flow Meters Company oil operated, three element, air control, oil operated, furnace pressure and air supply controlled by fan speed.

Superheater Temperature Control ..... Two—Leeds and Northrup, manual.

Chemical Feed Pumps ..... Two—Worthington Pump and Machinery Corporation horizontal duplex 1.56 gpm, 1200 psi, 205 rpm.

Lighter Oil Pumps ..... Two—Schutte and Koerting Company herringbone gear, 15 gpm, 300 psi.

BOILER FEEDWATER SYSTEM

Low Pressure Closed Heaters Four — Westinghouse Electric Corporation vertical, straight tube, two-pass, 2050 sq ft area.

High Pressure Closed Heaters Four — Westinghouse Electric Corporation vertical straight tube, two-pass, 1885 sq ft area.

Deaerating Heater and Surge Tanks ..... Two—Elliott Company vertical tray, counterflow, capacity deaerator 600,000 lb per hour. Surge tank capacity 105,000 lb at 310 F. Vent condenser 600 sq ft area.

Evaporator Deaerating Preheaters ..... Two—Elliott Company vertical tray, counterflow, capacity 24,000 lb per hour. Vent condenser 20 sq ft area.

Evaporators ..... Two—Foster-Wheeler Corporation single effect, horizontal 80-30 cupro-nickel coils, 840 sq ft area, capacity 20,000 lb per hour.

Heater Drain Pumps ..... Two—Worthington Pump and Machinery Corporation two stage opposed impeller, 140 gpm at 390 ft head.

Evaporator Feed Pumps ..... Three — Ingersoll-Rand Company two stage opposed impeller, end suction, 55 gpm at 220 ft head.

Heater Drain Controls ..... Fisher-Governor Company diaphragm air operated, pilot controlled through torque tube float chambers.

Boiler Feed Pumps ..... Four—Ingersoll-Rand Company six stage, casing 5.5% chrome and .5% molybdenum. 1455 gpm, 3550 rpm, 2485 ft head.

FUEL HANDLING

Belt Conveyors ..... Continental Gin Company capacity 500 tph 36" width belts, steel plate feeders, cast iron pulleys, gravity type take-ups.

Crusher ..... One—American Pulveriser Company ring type 720 rpm, capacity 500 tph.

Car Shake-Out ..... One—Robins Conveyors, Inc.

Railroad Track Scales ..... One set—Fairbanks Morse and Company. Four section, capacity 300,000 lb.

Crushed Coal Scales ..... Six—Richardson Scale Company automatic, 400 lb, weigh hopper, 40,000 lb per hour capacity.

Coal Handling System Ventilating Fan ..... One—American Blower Corporation (Sirocco), capacity 10,200 cfm at 5" s.p.

PIPING AND VALVES

Piping ..... The Grinnell Company.

General Service Valves ..... The Chapman Valve Manufacturing Company, main steam, motor operated, chrome-molybdenum bodies, stainless steel stem, stellite faced seats. Check valves, tilting disc.

High Pressure Small Valves. Manning, Maxwell & Moore, Inc.—Weld bonnet.

Blow-Off Valves ..... Manning, Maxwell & Moore, Inc.—tandem globe and angle, weld-bonnet, 1⅛" drum valves, 1" header valves.

Boiler Feedwater Check Valves ..... Edward Valves, Inc., 10" welded, angle.

Non-Return Valves ..... The Wm. Powell Company 12" chrome-molybdenum body, stellite discs, stainless stem.

Gas Fuel Shut-off Valves... Rockwell Manufacturing Company (Nordstrom). Lubricated plug cocks.

Gas Pressure Control Valve.. Fisher Governor Co.

Gas Feul Control Valves ... Hagan Corporation. V-port Butterfly.

Positive Closing Extraction Check Valves ..... The Chapman Valve Manufacturing Company tilting disc, air operated.

INSTRUMENTS

Control Boards ..... Republic Flow Meters Company.

Flow Meters ..... Republic Flow Meters Company.

Pressure Gauges, Indicating. Manning, Maxwell and Moore, Inc.

Pressure Gauges, Recording. Republic Flow Meters Company.

Liquid Level Indicators .... Republic Flow Meters Company.

Thermometers, Recording ... Republic Flow Meters Company.

Thermo-couples, Recording.. Leeds and Northrup Company.

Conductivity Recorders ..... Leeds and Northrup Company.

CO_2 Recorders ..... Leeds and Northrup Company.

Draft Gauges, Indicating ... Republic Flow Meters Company.

Barometers and Vacuum Gauges, Indicating ..... Manning, Maxwell and Moore, Inc.

Mercury Columns ..... Manning, Maxwell and Moore, Inc.

ELECTRICAL EQUIPMENT

Main Transformers ..... Seven—Westinghouse Electric Corporation (1 spare) single phase, 3 winding, water cooled. Capacity—hv 24,000 kva, lv 20,000 kva, tv, 26000 kva. Voltage—66420 v; 26550 v; 13200 v.

Station Service Transformers (a) For 2300 v service, 2—Westinghouse Electric Corporation 3 phase, air cooled; capacity—3750 kva self cooled, 5000 kva air blast; voltage—13800 v delta, 2300 v wye. (b) For 575 v service, 2—Westinghouse Electric Corporation 3 phase, air cooled; capacity 800 kva; voltage—2400 v delta; 600 v delta.

115 kv Oil Circuit Breakers. Ten — Westinghouse Electric Corporation, 2,500,000 kva interrupting capacity.

46 kv Oil Circuit Breakers.. Twelve—Westinghouse Electric Corp., 1,500,000 kva interrupting capacity.

15 kv Air Circuit Breakers.. Two — Westinghouse Electric Corp., 4000 amp, 1,566,000 kva interrupting capacity.

Insulators ..... Ohio Brass Company.

Power and Control Cables .. Okonite Co. and Rockbestos Products Corp.

2300 v Station Service Switchgear ..... Westinghouse Electric Corporation; Type, metal-clad with 30 type 50-DH-100 Deion air circuit breakers.

575 v Station Service Switchgear ..... I.T.E. Company; Type—three metal enclosed main sections with 2 type KC, 2 type KB and 47 type KA 600 volt air circuit breakers. One metal enclosed coal handling section with 4 type HV-100, 2400 v air circuit breakers and 12 type KA 600 v air circuit breakers.

208 v Station Service Switchgear ..... Westinghouse Electric Corporation.

Motors ..... For Unit No. 1—Westinghouse Electric Corp. For Unit No. 2—General Electric Co.

Electrical Indicating Instruments ..... Weston Electrical Instruments Corp.

Relays ..... General Electric Co. and Westinghouse Electric Corporation.

Generator Voltage Regulator General Electric Co.; Type—GFA-4

Lighting Equipment ..... Westinghouse Electric Corp.

Fire Protective Equipment for Switchgear ..... C-O-Two Fire Equipment Company; Type—two groups with ten 50 lb cylinders, manual systems; one group with seven 50 lb cylinders, manual system. One group with six 50 lb cylinders, electric automatic system.

MISCELLANEOUS

Heat Insulation for Piping and Ductwork ..... Badham Insulation Company, Inc.

Forced Draft and Induced Draft Ductwork ..... The Birmingham Fabricating Company.

Generator Room Crane ..... One—Whiting Corporation main hook 125 tons capacity. Auxiliary hook 15 tons capacity. Span 59 ft 6 in.

Traveling Water Screens ... Three—Link Belt Company capacity 60,000 gpm.

Low Pressure Water, Twin Strainers ..... Seven—Elliott Company.

House Service Water Pumps. Three — Ingersoll-Rand Company single stage, double suction, capacity 1000 gpm at 220 ft total head.

Service Air Compressor ... One—Ingersoll-Rand Company 12" x 11" straight line, single stage. Capacity 804 cfm free air at 100 psi.

Control Air Compressor .... One—Ingersoll-Rand Company 8" x 9" straight line, single stage. Capacity 108 cfm free air at 100 psi.

Sump Pumps ..... Three—Goulds Pumps, Inc. 1—duplex each pump capacity 300 gpm at 85 ft head; 1—capacity 125 gpm at 65 ft head; 1—capacity 125 gpm at 35 ft head.

NO "FREEZE-UP" with YARWAY TRAPS

Yarway Traps beat the worst weather in this installation at Thermoid's Trenton plant.

Troubled with outdoor steam traps freezing? Solve the problem the way Thermoid did at their Trenton, N. J., plant.

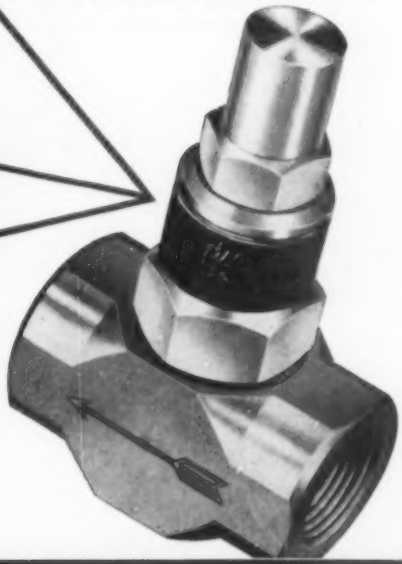
They installed Yarway Impulse Steam Traps on coal handling equipment. Now, though temperatures dip to zero and snows pile high, their traps never freeze.

Condensate does not accumulate in Yarway Impulse Traps. The only moving part—a little valve—floats on the load. It discharges condensate as it comes through, instead of waiting for a quantity to accumulate. Hence—nothing to freeze.

Add to that, Yarway Traps' reputation for low maintenance, quick heating, easy installation, and economy of operation and you have reasons why over 600,000 Yarways have already been bought.

Often it costs less to install new Yarways than to repair old type traps. See your nearest Mill Supply Dealer. For his name, and free Yarway Trap Book, write . . .

YARNALL-WARING COMPANY
Home Office: 116 Mermaid Ave., Phila. 18, Pa.
Southern Representative: ROGER A. MARTIN
Bona Allen Building, Atlanta 3, Ga.



YARWAY IMPULSE STEAM TRAP

Helping the MAN·IN·THE·PLANT

Readers are invited to send in kinks, ideas, and suggestions. Payment is made for all material accepted.

Feeding by Vibration

AN important phase of materials handling in many different industries is that of feeding or conveying by vibration. There are different types of vibrating feeders, most of which are designed in such manner that the deck, trough, or other element feeding the material has a fast-recurring, reciprocating movement produced by an electromagnet pulling it in one direction and springs of leaf type returning it in the other. However, the arrangement is such that the impulses of the magnet pull the trough or deck sharply downward, as well as backward, while the action of the springs is to return it upward and forward. Thus, the electromagnet sharply pulls the feeding trough or deck out from under the material each time, while the returning spring-actuated motion, having an upward trend, naturally impels the material forward.

Such vibrating feeders handle all kinds of bulk materials. The speed of feed is controlled by varying the voltage of the pulsating electric current going to the electromagnet. Anything from large lumps of stone and ore down to fine carbon dust may be successfully handled in this manner.

Not infrequently, small parts of plastic, metal, or other material are vibration-fed for various types of operations. Chemicals are fed for treating water and sewage. Furnaces, sinters, retorts, and calciners may be provided with a steady flow of material by vibrating feeders. Not infrequently, the capacity of pulverizers, crushers, hammer mills, ball mills, and tube mills is increased by using this type of feeder. Likewise, the efficiency of screens, magnetic separators, mixers, and digesters is often improved because a vibrating feeder allows just the correct volume of material feed to be supplied to them.

By placing a number of such vibrating units in proper relationship to one another, end to end, so that each one delivers into the one following, a long vibrating conveyor can be arranged, and because all of the conveyor contacting the material is of metal, very hot materials can be conveyed without any danger of burning the handling unit and without fire hazard. In fact, there are various instances where the feeding elements consist of a tube-like trough so that material being fed is kept from contact with the surrounding atmosphere. This allows handling dusty or poisonous materials without contaminating the atmosphere. Also it allows clean materials to be conveyed, without danger of being contaminated.

Another very interesting thing about these feeders is that by equipping them with an electric clock timer, they can be arranged to feed on any predetermined intermittent schedule and to remain quiescent the remainder of the time.

Faster Nut Running

A SAVINGS of approximately 40 per cent on nut-running and screw-driving jobs over the methods previously used, was effected by using the Cleco A-3 Impact Wrench, according to a recent report received by the company from a Southwestern aircraft manufacturer. The aircraft company also noted an improvement in the quality of the work due to use of the Cleco Impact Wrench. Cleco Division of the Reed Roller Bit Company is the manufacturer of the tool.

HERE'S YOUR *Complete* STEAM PLANT

- One purchase, backed by undivided responsibility.
- Shipped completely assembled after factory tests to assure highest operating efficiency.
- More than 80% thermal efficiency guaranteed.
- 4-pass design provides 5 sq. ft. of heating surface per b.h.p.
- Induced draft fans which are built-in eliminate the need of an expensive chimney.
- Simple installation requires no special foundation.
- Clean, quiet operation.
- Heavy-duty, rugged construction assures long-lived dependability.
- Burner equipment to suit your fuel: gas, oil or both.
- 17 sizes from 20 to 500 b.h.p. for pressures up to 250 p.s.i., or for hot water heating.
- For complete details, write today for catalog 211.

Superior
STEAM GENERATORS

SUPERIOR COMBUSTION INDUSTRIES, Inc.
Factory: Emmaus, Pa.
Executive Offices: Times Building, Times Square, New York 18, N. Y.

Does That Old Machine Pay?

MACHINERY in regular use is often more costly to use than we suspect. We see our machines doing their work for us day after day and, off hand, we are satisfied. We are inclined to agree that a change to something better would be "all right", but we think it would be very expensive, so we allow things to "ride" as they are.

The above paragraph is inspired by an actual instance that the writer considers worth telling about in print. A prominent concern had two machines driven from 150 hp, 585 rpm, slip ring motors which drove the machines at a speed of 119 rpm through chain drives. One of these chain drives became so badly worn that it was found necessary to replace it, and it so happened that it was replaced by a V-belt drive.

Anyway, the new drive operated very satisfactorily and the sales engineer "followed it up" from time to time in the hope that, in a short time, he would be given an order for a second drive to replace the chain drive still remaining. However, the president of the company appeared to be in no hurry.

The sales engineer didn't relish the prospect of waiting a year, but what could he do? Fortunately for the salesman, though, events changed in his favor. The president of the company suddenly decided to do some investigating, so he had an electrician make some tests on the belt drive and on the chain drive and make a comparison of the two. The electrician found a difference of 32 amperes at 440 volts in favor of the belt drive. This indicated saving was so great that the president thought the electrician had made a mistake, so he had the utility serving them check the readings. The utility company obtained the same results. So, of course, the president ordered the second V-belt drive at once, at a time when the sales engineer happened to be on vacation.

This writer does not know the actual saving effected, but on the basis of 3 phase current the saving would be approximately 21 to 23 cents per hour, with the drive at the time running 24 hours per day with but short intervals of shutdown. Let us say that the saving amounted to 20 cents per hour, or, $4.80 per day. If the drive was operated continuously, or most of the time (as it was), it can easily be shown that the saving amounted to about $1700 per year, which surely is a worth while saving.

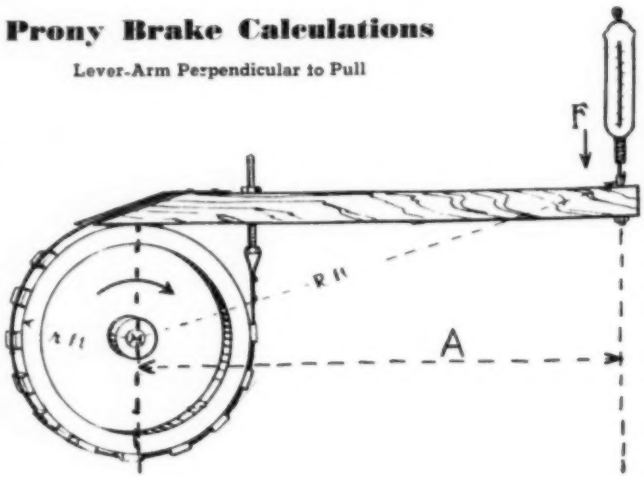
To be perfectly fair there are two features that should be brought out. The first is that the chain drive was in very poor condition, and it is not desired to imply that all chain drives should be replaced, regardless. A good chain drive, the writer wishes to state, is more efficient than any other drive of which he has knowledge, with an efficiency very close to 100 per cent. Chain drives don't slip, and they don't creep. In this instance the chain drive was in a very dusty location and it was necessary for the owner to spend considerable time and money in maintaining the chain, and also there was the cost of the lubricant that was needed for the chain. The second consideration is: actual readings were not taken of the first drive, and inasmuch as the first drive was in a worse condition than was the drive on which the readings were taken we can safely assume that the owner's saving was even greater than the above estimated figures.

S. W. FORT

Memphis, Tenn.

Prony Brake Calculations

Lever-Arm Perpendicular to Pull



THE accompanying sketch shows a conventional Prony Brake arrangement. The set-up is quite all right, but errors are frequently made in calculating results from data thus obtained.

There seems to be a tendency to use dimension "R" as the lever-arm in combination with the scale reading "F" to get the effective foot-pounds. That is wrong. If the scale pull is vertical as shown, then the horizontal distance "A" in feet must be used as a multiplier of the force "F" in pounds to get foot-pounds.

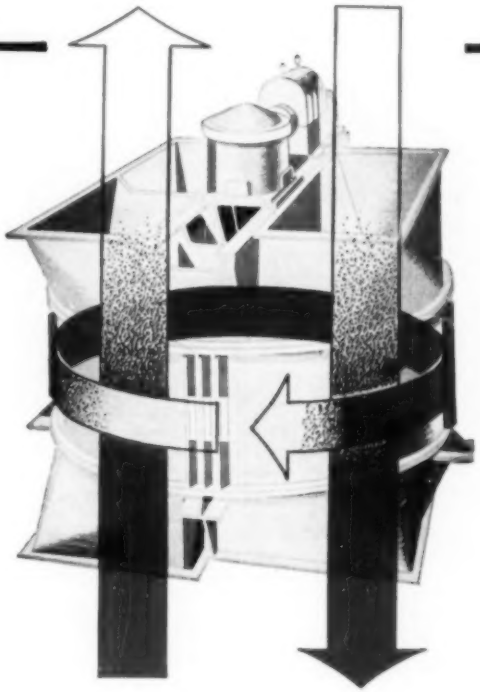
Or if desired, the lever-arm may be rotated clockwise (leaving the scale pull vertical) until "R" is perpendicular to the scale pull. Then it would be quite correct to use "R" as the lever-arm in calculating foot-pounds.

In other words, it is necessary to remember that the lever-arm dimension used must be perpendicular to the direction of scale pull.

W. F. SCHAPHORST

more than 160,000,000 lbs/hr of post-war steam generating capacity

equipped with *Ljungstrom*
AIR PREHEATERS



Here indeed is impressive evidence of the wide acceptance of the Ljungstrom air preheater. Since the war the total capacity of steam generating units equipped with Ljungstrom air preheaters, installed, under construction or on order in industrial and utility plants throughout the country comes to well over 160,000,000 lbs of steam per hr.

The reasons for the steadily increasing preference for the Ljungstrom air preheater are simple enough. The continuous regenerative counterflow principle assures maximum heat transfer with minimum weight and size. Flexible and compact, it may be used in a wide range of applications. Its proven reliability and low maintenance eliminate costly shutdowns.

If you are planning to build a new plant or modernize an old one, investigate the possibilities of the Ljungstrom. The specialized experience of Air Preheater engineers is at your disposal, to aid in effecting the most economic heat recovery from flue gases.

The Ljungstrom operates on the continuous regenerative counterflow principle. The heat transfer surfaces in the rotor act as heat accumulators. As the rotor revolves the heat is transferred from the waste gases to the incoming cold air.

THE AIR PREHEATER CORPORATION
60 EAST 42d STREET • NEW YORK 17, NEW YORK

NEWS
FOR SOUTHERN INDUSTRY

Automatic—Alabama & Mississippi

Appointment of CECIL ROY POND as sales representative in BIRMINGHAM, ALABAMA, for the AUTOMATIC TRANSPORTATION COMPANY, Chicago manufacturer of materials handling equipment, has been announced by Elmer F. Twyman, general manager.

Pond will handle the entire line of electric industrial trucks and battery-powered hand trucks. His territory will include Alabama and the northwestern part of Florida. Headquarters are at 625 Comer Bldg., Birmingham.

Pond has been associated with Automatic since 1945, until now as sales and service engineer for the E. H. Fairchild Co. Before 1945 he was with the Sinclair Refining Co.

Announcement has also been made of the appointment of JAMES F. McCABE as LOUISIANA and MISSISSIPPI sales representative for the company. The newly franchised firm, located at 348 Baronne St., New Orleans, operates under the name of JIM McCABE, MATERIALS HANDLING EQUIPMENT.

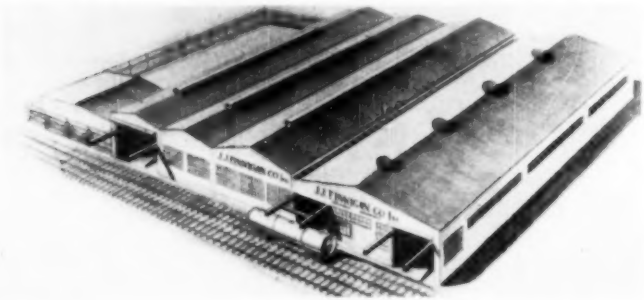
MR. POND
(Automatic)

Prior to forming his own company in 1946, McCabe was with United Motor Service and the Goodyear Tire & Rubber Co. During World War II he served with the Federal Government, directing the tire rationing program for Louisiana.

J. J. Finnigan Company Expands

J. J. FINNIGAN COMPANY, INC., Atlanta manufacturer of boilers, tanks and other vessels for industrial use, has completed initial stages of expansion in its plant at 455 Means Street, N. W. Girder construction is nearing completion on two new buildings to be added to the present structure. When complete, this new addition will increase present floor space by 10,000 square feet.

The company has been fabricating various shapes and sizes of boilers, tanks, pressure vessels and storage vats since 1888 for the textile, paint, food, power and many other industries. This latest expansion program, announced by William J. McAlpin, President, is designed to increase the plant's productive capacity, by permitting the addition of new fabricating equipment. Increasing demand by industry for smokestacks alone has made these additions imperative, Mr. McAlpin stated.



Organized 62 years ago as a boilermaking and boiler repair shop, the company still boasts one of the most complete boiler plants in the Southeast. Engineering development since McAlpin took over the presidency in 1933 has gained for the organization a recognition in the fabrication of steel, stainless steel, stainless clad and other alloy equipment second to none in the South. With the growth of textiles in this area, the company has earned an enviable reputation in the fabrication of stainless steel vats for package dyeing and sizing. While boilers, tanks and boiler repairs still play an important part in the business, J. J. Finnigan Company is presently equipped to assist in the design and specifications of equipment for many industries requiring specially built items to meet particular requirements.

Other officers of the company are Mrs. Mae E. McAlpin, Secretary-Treasurer; C. F. Breen, Vice-President; L. I. Chafin, Supt. and Chief Engineer.

FUTURE EVENTS
Of Engineering Interest

AMERICAN INSTITUTE OF MINING & METALLURGICAL ENGINEERS, Sec'y, 29 West 39th St., New York, N. Y.
Feb. 12-16, Annual Meeting, New York.

NATIONAL PLASTICS EXPOSITION, Dale Amos, Chmn. of Exposition Committee, Amos Molded Products Co., Edinburg, Ind.
Mar. 28-31, Navy Pier, Chicago, Ill.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, Region VIII, Sec'y, 29 West 39th St., New York, N. Y.
Mar 30-Apr. 1, Annual Meeting, Baker Hotel, Dallas, Texas.

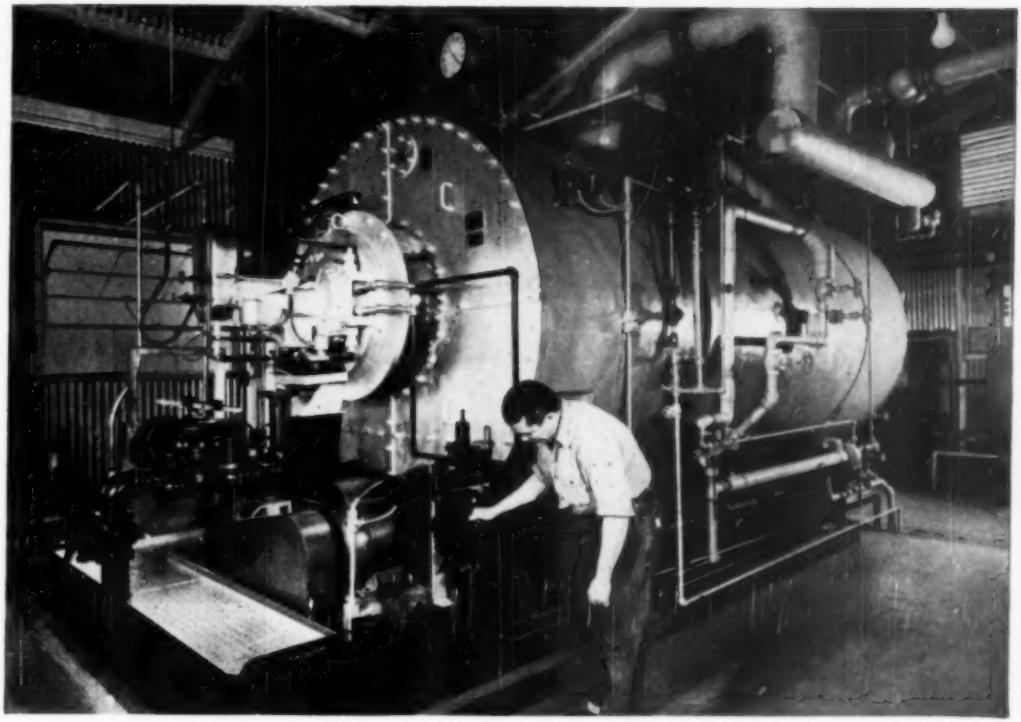
ASSOCIATION OF IRON & STEEL ENGINEERS, Sec'y, 1010 Empire Bldg., Pittsburgh, Pa.
Apr. 3-4, Spring Conference, Birmingham, Ala.

MIDWEST POWER CONFERENCE, Roland A. Budenholzer, Dir., Illinois Institute of Technology, 3300 S. Federal St., Chicago 16, Ill.
Apr. 5-7, Twelfth Annual Conference, Sherman Hotel, Chicago, Ill.

AMERICAN SOCIETY OF TOOL ENGINEERS, Sec'y, 2567 W. Grand Blvd., Detroit, Mich.
Apr. 10-14, Industrial Cost-Cutting Exposition, Philadelphia, Pa.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, Sec'y 29 West 39th St., New York, N. Y.
Apr. 12-14, Spring Meeting, Hotel Statler, Washington, D. C.

Boiler HORSEPOWER Isn't Enough



Modern Boilers must have EARNING POWER, too

BECAUSE the cost of generating steam — for processing, production or heating needs — demands a substantial share of your operating budget, you can't afford to be complacent about your boiler.

If you want to cut fuel and maintenance costs, look to your boiler. Look beyond boiler horsepower ratings and rate your boiler in terms of its *earning power* for you — its ability to deliver steam at lowest cost.

For any boiler installation (15 to 500 HP.) — new or replacement — Cleaver-Brooks offers these immediate and long range cost saving advantages:

A Custom-Planned Boiler Engineered for Your Needs: Your steam needs and steam-using equipment are studied — your present total steam load plus your estimate of future expansion are considered — with this information the size of Cleaver-Brooks boiler best suited to your specific needs is determined.

Factory Starting Service: Your boiler is placed in operation by Cleaver-Brooks factory service-engineers. Your operators are trained in operation, care and maintenance.

Flexible Operation Burning Gas or Oil With Equal Efficiency: You can use oil, gas, or combination oil and gas, whichever is of lower cost. Through high heat transfer, Cleaver-Brooks boilers operate at a guaranteed efficiency of 80% from full load down to 30% of rating.

In addition, Cleaver-Brooks boilers give you clean, smokeless operation — eliminate fuel and ash handling — require no high or costly stacks — no special foundations — fit under low headroom—provide quick steaming, flexible operation to meet fluctuating loads — fully meet all codes.

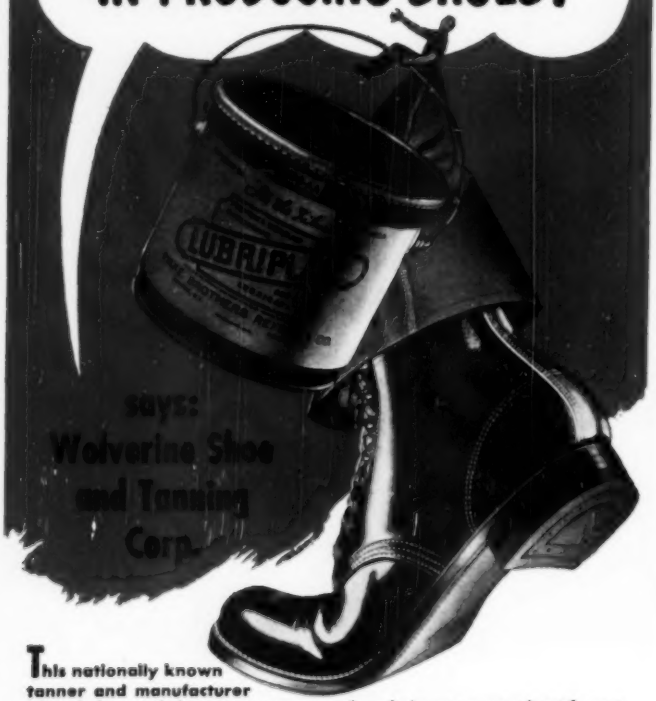
Available in sizes 15 to 500 HP., 15 to 200 P.S.I. — write for Cleaver-Brooks steam boiler bulletin.

CLEAVER-BROOKS COMPANY
365 E. Keefe Ave., Milwaukee 12, Wis.

WRITE on your business letterhead for Steam Cost Calculator — a ready reference slide rule showing comparative steam costs when using oil, gas, or coal as fuel. Mailed on request—no obligation.

Cleaver-Brooks
STEAM BOILERS

THIS LUBRICANT SAVES 7 TIMES ITS COST IN PRODUCING SHOES!



This nationally known tanner and manufacturer of work shoes and gloves writes us . . .

". . . You recommended to us LUBRIPLATE NO. 100 for lubricating the chain drive on our paddle wheels which turn the hides immersed in a solution in concrete vats. The chain, during use, is always soaked. The solution is sometimes acid and sometimes caustic. Up to the time of your recommendation, we had not found any lubricant that would stay on the chains for any appreciable time.

"Heretofore, the average life of a chain was approximately one year. We have applied LUBRIPLATE to these chains every two weeks for two years. Since then, not one new chain has required replacement, and they are still going strong.

"At this time it appears that *for every dollar we have invested in* LUBRIPLATE, *we have saved seven dollars* in chains with actual savings still to come."

WOLVERINE SHOE & TANNING CORP.
Rockford, Michigan

You, too, can enjoy the savings made possible with LUBRIPLATE Lubricants. There is a LUBRIPLATE product for every industry. LUBRIPLATE reduces friction and wear, prevents rust and corrosion and is most economical to use. Write today for case histories of savings made possible by the use of LUBRIPLATE Lubricants in your industry.

LUBRIPLATE DIVISION • Fiske Brothers Refining Company
Newark 5, New Jersey • Toledo 5, Ohio
DEALERS EVERYWHERE • SEE YOUR CLASSIFIED TELEPHONE BOOK

LUBRIPLATE the Modern Lubricant

A.I.I.E. Atlanta Chapter

THE ATLANTA CHAPTER of the AMERICAN INSTITUTE OF INDUSTRIAL ENGINEERS was recently formed at a meeting at Georgia Tech. About thirty industrial engineers from the area, members and pending members of the national organization, approved the final draft of the Chapter Constitution, and elected the following officers: C. B. FOOS, Georgia Tech, President; CHARLES BASTEDO, Atlantic Steel Co., Vice President; FRANK B. TAYLOR, Cluett, Peabody & Co., Secretary; ROBERT E. ESKEW, Georgia Tech, Treasurer.

◆

OG&E Elects President

The Board of Directors of the OKLAHOMA GAS AND ELECTRIC COMPANY has elected DONALD S. KENNEDY to become president of the Company succeeding GEORGE A. DAVIS, retired.

MR. KENNEDY
(OG&E)

Mr. Kennedy has been associated with OG&E since 1923, when he was employed as a clerk. He has worked in various capacities with the company. During his 26 years residency in Oklahoma, Mr. Kennedy has been a leader in community affairs.

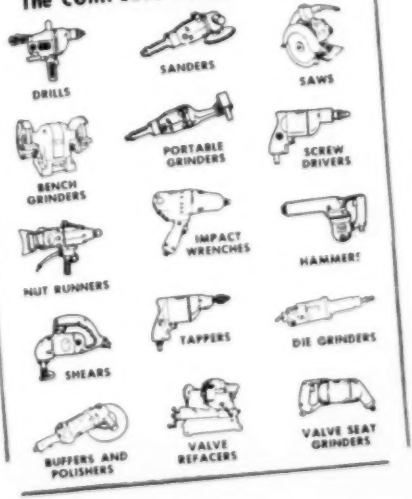
◆

National Radiator Appoints Scates

A. C. SCATES has been named sales representative in MISSISSIPPI and LOUISIANA, and in the southern portion of ARKANSAS, for the NATIONAL RADIATOR CO., Johnstown, Pa. Territorial sales headquarters will be maintained at 311 Downing St., Jackson, Miss. Mr. Scates is well known in this area of the South, having served for many years as manager of the N. O. Nelson Company branch in Jackson, Miss.

for your
greater convenience
BLACK & DECKER'S
ATLANTA, GEORGIA
Sales and Service Branch
Now Located at
316 TECHWOOD DRIVE, N.W.
Phone: Lamar 0431

The COMPLETE Electric Tool Line



At 316 Techwood Drive, N.W.

We Offer You . . .

- **Convenient Central Location!**
- **Plenty of Off-Street Parking Space!**
- **Enlarged Shop Facilities!**

Electric Tool Headquarters has increased its facilities in the Southeast area to give you faster, more convenient service on Black & Decker, Van Dorn and Home-Utility products. We have enlarged our shop facilities . . . increased our stock of all genuine replacement parts . . . and our expert repairmen are ready to give you quick "factory" service at a more convenient location . . . all in our own brand-new building. There's ample, easy, off-street parking in our private lot. And a big, modern showroom carries a complete display of all our world-famous products. Factory service from company-owned-and-operated branches convenient to customers was an innovation with Black & Decker in the electric tool industry!

Black & Decker
ELECTRIC HOME-UTILITY TOOLS "Van Dorn"

ELECTRIC TOOL HEADQUARTERS

Other Service Branches in the South at
Charlotte, Dallas, Houston, Memphis, New Orleans, St. Louis, Cincinnati

YARWAY
IRON
Easy
TO SERVICE
• A good strainer protects your equipment and pipelines.
Maintenance men said "give us a strainer with a blow-off cap that comes out easily and makes up tight; a screen that can be put back in place without a lot of fiddling around".
• The easy-to-remove Yarway cap meets these requirements. It has straight (not tapered) thread, machined face and spark-plug-type gasket. Permits easy removal for cleaning. Insures proper screen alignment when replaced in body.
• Screen itself is of high grade woven monel wire, or perforated if desired.
• Body of strainer is iron or steel, cadmium-plated for protection against corrosion and for better appearance.
• Available in six sizes, ½" to 2", for pressures to 600 lbs. Reasonably priced. Hundreds of thousands in use. Stocked and sold by 150 Mill Supply Houses.
• See your dealer or write for Bulletin S-201.
YARNALL-WARING COMPANY
Home Office: 116 Mermaid Ave., Phila. 18, Pa.
Southern Representative: ROGER A. MARTIN
Bona Allen Building, Atlanta 3, Ga.
YARWAY STRAINERS
"Police the Pipelines"

Shand Associated with Material Handlers

MATERIAL HANDLERS, INC., with headquarters at Charlotte, N. C., has announced that GADSDEN E. SHAND, JR., prominent South Carolina engineer of Columbia, S. C., is now associated with them and will represent them and their manufacturers in South Carolina.

Shand Engineering Sales Company, of Columbia, S. C., has specialized in materials handling systems and equipment for several years, and Mr. Shand has installed many materials handling systems in S. C. industrial plants which have attracted considerable attention.

MR. SHAND

Material Handlers, Inc., engineers and sells a wide line of materials handling equipment. The firm was organized in 1947 by Lewis H. Fallis, and J. Toms Dover, Jr., and originally handled only the Louden Machinery Company's monorail in North Carolina and the Samuel Olson Manufacturing Company's engineered conveyor systems and gravity and belt conveyors in both North Carolina and South Carolina. They continue to handle those lines as well as Towmotor Corporation's fork lift trucks and industrial tractors; A. B. Farquhar Company's bulk and package conveyors; Re-Bo Manufacturing Company's floor, platform and hand trucks, casters, skids and bins; Fairbanks Company's trucks, pack lifts, casters and wheels; Plymouth Locomotive Company's line of industrial locomotives; Jervis B. Webb Company's Towveyor and endless overhead chain conveyors; and a complete line of accessories and miscellaneous materials handling equipment such as pallets, bridge ramps, hoists and cranes. Material Handlers, Inc., is also equipped to give their customers complete service through having factory trained service personnel and a large supply of replacement parts.

During the War, Mr. Shand was

District Production Manager of the War Production Board in charge of the production of war materials in S. C. for which he was highly commended by the W. P. B. Mr. Shand will continue to operate Shand Engineering Sales Company as associates of Material Handlers, Inc.

◆

Vulcan Appoints Allshouse

DON ALLSHOUSE, since 1928 Advertising Manager for NORTHERN EQUIPMENT CO., Erie, Pa., manufacturers of Copes boiler feed water regulators and allied equipment, has also been named Advertising Manager for VULCAN SOOT BLOWER CORP., Dubois, Pa.

A consolidated advertising department for these two divisions of Continental Foundry & Machine Co., will be maintained at 1945 Grove Drive, Erie, Pa.

◆

New Sales Division—G. E.

Effective Jan. 1, 1950, the Apparatus Agency Division of General Electric's Industrial Divisions has been replaced by a newly organized Agency and Distributor Division.

GEORGE L. IRVINE has been appointed manager of the new division, and R. D. MOORE is assistant manager. They will be responsible for the sale of all G-E Apparatus Department products through agents and to distributors, wholesalers, and dealers.

◆

Garlock Appointments

THE GARLOCK PACKING COMPANY has announced the retirement of PHIL ARNOLD, Vice President, effective January 31, 1950, from his duties as head of the sales organization. Mr. Arnold will continue in a partially active capacity as vice-president of the company.

Effective Feb. 1, 1950, Mr. LOUIS MOHN is general sales manager of the company with headquarters at Palmyra, N. Y. Mr. Mohn was formerly district sales manager at Pittsburgh, Pa.

MR. EUGENE G. FLANNERY, heretofore a sales representative in the Pittsburgh territory, succeeds Mr. Mohn as district manager in Pittsburgh.

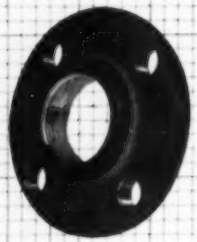
◆

Westinghouse Welding Department

J. O. CLEVENGER has been appointed manager of the Westinghouse Electric Corporation's welding department.

Horses
MONEY
You needn't be concerned with horses, real or mechanical, to profit from the experience of a roving amusement ride operator in Michigan.
He liked to give the youngsters a real whirl for their money. But he couldn't make money when the spinning horse carts broke down or when the kids were so jolted by abrupt starts that they were afraid to ride. Operating difficulties were spoiling the fun — and the profits.
At wit's end, the troubled operator called in Winsmith. It turned out to be true that a stock Winsmith reducer fit the job as a nut fits a bolt. But what really brightened the profit picture were the transmission improvements recommended by the Winsmith factory trained engineer who called. Effected at a negligible cost, they accomplished smooth, low-torque starting, permitted discarding of unpopular safety belts and eliminated shaft breakages. No more profit losses — the mechanical steeds now ride in the money.
Your applications of power transmission may be remote from the amusement field. They may call for large, heavy duty speed reducers to operate sewage sludge agitators, or for fist-size units to rotate a glittering array of appliances on a display table.
Whatever the use, it's worth remembering that with Winsmith you get widest selection of stock reducers anywhere — and at the lowest cost. But what the ride operator remembers most about Winsmith is what will impress you the most from your very first contact . . . unique individualized service by factory trained transmission engineers.
FREE
CATALOG HANDBOOK No. 148
If you have it, get your name on the mailing list for new 1950 edition by writing today.
WHS
WINSMITH
SPEED REDUCERS
WINFIELD H. SMITH CORPORATION

Specify
CAMCO
for Extra Value



For Better Performance Order
All Companion and Slip-on
STAINLESS STEEL FLANGES
Up To and Including 2" I.P.S.
Machined from Drop Forgings

They COST NO MORE than
Competing Cast Flanges

SAVE WITH CAMCO

- Cylindrical Fittings up to and including 2" I.P.S. are machined from bar stock.
- Elbows and Tees up to and including ¾" I.P.S. are machined from drop forgings.

Orders filled promptly from stock from ⅛" to 4" I.P.S. inclusive in types 304, 316 and 347 stainless steel.

If your local jobber cannot supply you with CAMCO fittings, write today for name of nearest distributor.

CAMCO PRODUCTS INC.
25 Fox Street
New Haven 15
Connecticut

In 1939, Mr. Clevenger became manager of the construction and communication section. He was transferred to Atlanta, Georgia, as manager of agency and specialty sales for the Southeastern District in January, 1947, and was located there until his present appointment.

◆

Eutectic Welding—Southwest

EUTECTIC WELDING ALLOYS CORPORATION, 40 Worth Street, New York, manufacturers of low temperature welding alloys and fluxes, announces the promotion of HAROLD DUNCAN to the position of Assistant Regional Manager.

Formerly District Engineer in Texas, Mr. Duncan now is in charge of a group of Eutectic District Engineers, servicing users of Eutectic products throughout the Southwest.

MR. DUNCAN

OKLAHOMA FABRICATOR EXPANDS IN KANSAS

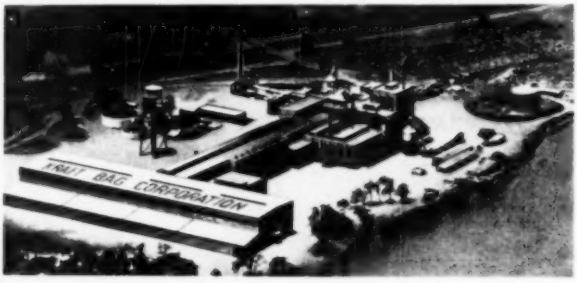
The Star Manufacturing Company of **Oklahoma City, Oklahoma,** has been expanding its manufacturing and wholesale operations in Oklahoma, Texas, Colorado, and recently in Kansas.

At the present time, production in this 30,000 sq ft factory in Turner, Kansas, is being concentrated on steel industrial bins and shelving. **Raymond V. Schroeder,** general manager of the Turner, Kansas, operation, will describe, in an early issue of SP&I, materials handling techniques and other modern production methods employed in this plant.

NEW PAPER CONVERSION PLANT—GEORGIA

The above airview shows the pulp and paper mill of **St. Marys Kraft Corporation** and the new conversion plant of **Kraft Bag Corporation** now in full operation at St. Marys, Georgia.

In foreground is the new Kraft bag factory, where heavy-duty, multi-wall shipping sacks are produced by the most modern and efficient methods. The bags are sewn or pasted, open-mouth or valve types, 2 to 6 ply, and are custom-made to exact specifications. The mill at St. Marys which converts slash pine into pulp and turns out Kraft paper for shipping sacks, wrapping and other paper products, employs over 500 persons.



are businessmen

COLD-BLOODED?

OF COURSE NOT! Literally, their normal body temperature is 98.6—same as laborers, engineers or any other group of people. And, figuratively, they're no more, or no less, cold-blooded—as a group.

We all know unreasonable generalizations can be dangerously false. Common sense and on-the-job experience show us the value of dealing specifically with ideas, problems—and *people*.

Let's not make the big—and costly—mistake, then, of generalizing on religious or racial groups. Adopt and *carry out* these common sense principles:

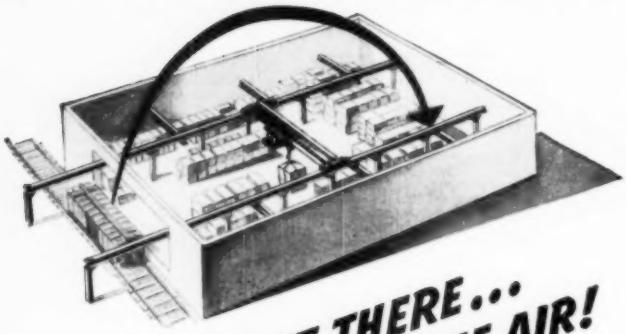
1. Accept—or reject—people on *their individual worth.*
2. Don't listen to or spread rumors against a race or a religion.
3. Speak up, wherever we are, *against* prejudice. Work for understanding.

A PUBLIC SERVICE PROJECT ★ THE ADVERTISING COUNCIL ★

Published in the public interest by:

SOUTHERN POWER & INDUSTRY

FOR GREATEST ECONOMY OF SPACE AND MANPOWER



PUT IT THERE... THROUGH THE AIR!

A quick hook-on to a pallet, basket or standard sling and the load is whisked away—cutting across occupied floor space—straight to the spot where you want it.

It's smart, and thrifty to use "through the air" transportation as widely as you can in plants and warehouses. Compare this method for overall cost, efficiency, maintenance and safety before you allow other means of transfer to overlap the service that is best performed by cranes and hoists!

Let the Shepard Niles specialist break your problem down for you he's experienced, skillful and he has the maximum number of sizes and types in his product line.

Shepard Niles

CRANE & HOIST CORPORATION

Makes and sells all three lifting tools for airborne shop loads

455 SCHUYLER AVENUE • MONTOUR FALLS, N. Y.

Industrial Products

W. B. SHIRK has been made director of Industrial Products Engineering in the newly-formed Product Development and Product Engineering section of GULF OIL CORPORATION.

MR. SHIRK

Mr. Shirk is an electrical engineering graduate of Lehigh University, '20. He received his early education in Lebanon, Pa., grade and high schools. After some years with Bethlehem Steel Corp. and the Westinghouse Electric Corp., he joined the Gulf organization as a lubrication engineer in 1932. He has recently been serving as Chief Industrial Lubrication Engineer in lubricating sales.

MR. GODDARD

HOMER A. GODDARD, JR., has been named assistant general manager for Industrial marketing. In his new post, created as part of the firm's reorganized domestic marketing program, Mr. Goddard will be responsible for direct sales of Gulf products to industrial plants and organizations.

◆

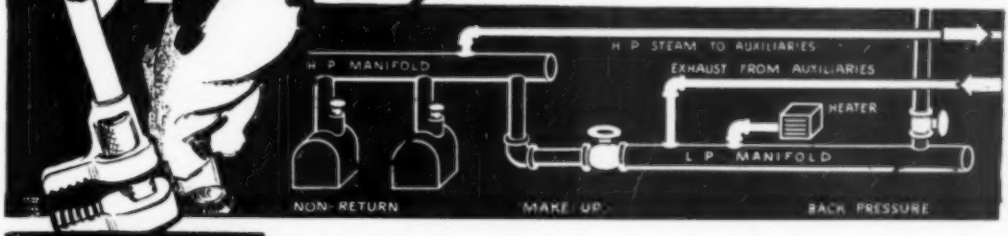
Graver—Tulsa Agent

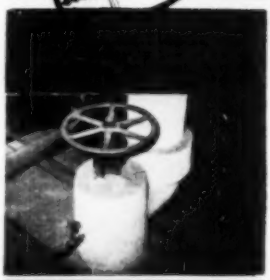
In the sales expansion program of GRAVER WATER CONDITIONING CO. since its establishment as a separate division of Graver Tank & Mfg. Co., Inc., the concern has appointed PROCESS EQUIPMENT CO. as its sales agent at Tulsa, Okla.

3 WAYS TO KEEP OUT OF TROUBLE

ON

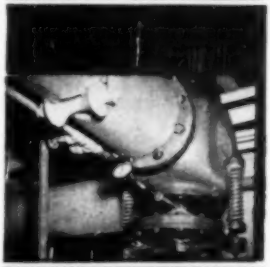
MANIFOLD HEATING SERVICE





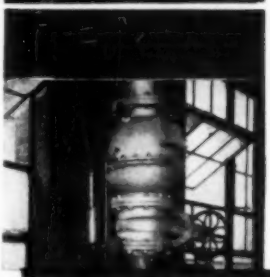
Automatic Non-Return Valve, serves as stop and check valve, necessary when more than one boiler serves the same manifold. Outside yoke and handwheel for manual closing — insures positive protection for repairmen when the boiler is down — permits boiler isolation when running separate tests — protects against discharge of steam in case of manifold failure.

Low pressure drop across the seat due to large areas in relation to pipe line sizes. Single seat, guided main valve with internal dash-pot cushion. Sizes 2½" to 12", flanged in angle, globe or elbow types. Standard for 250# saturated steam, 475°F, is semi-steel with bronze trim and alloy steel seat ring; others, suitably trimmed are available for pressures to 1500# and 900°F. Globe type, supplied without screw and yoke for a full sealed line where manual closing is not required, is frequently used as a horizontal check valve in gas or liquid service where exceptional reliability is required.



Type J-2 Pressure Reducing Valve serves as a make-up valve between the high pressure manifold and the low pressure manifold, so that heating demands are met in spite of any deficiency in supply of exhaust steam from the auxiliaries. Because of its double seated, direct-acting construction, it follows pressure variations in the low pressure manifold rapidly and provides a smooth flow regardless of fluctuations in boiler pressure or in the demand.

Type J-2 is operated by a spring-opposed diaphragm, which makes adjustment and maintenance simple. Standard construction provides for a remote service line which permits use of a relatively large low pressure manifold as a receiver. 1" to 2" sizes available with screwed connections; 2½ through 8", flanged. For initial pressures to 250#, 475°F; reduced pressures from ½# to 50#. Single seated construction available for 1"-2" sizes.



Type 34-R17 Back Pressure Valve and Vacuum Breaker protects the low pressure manifold against excess pressures, and assures proper back pressure on auxiliaries. Large area valve in relation to connected line size, provides ample capacity, and promptly relieves small build-up with reduced lift.

Bronze faced dash-pot prevents chattering and definitely prolongs the life of the valve. Provision is made for a water seal so that the system can be operated below amospheric pressure and still give excess pressure protection. Sizes 2½" to 8" with relief of 1# to 15#; 10" to 20" with a range of 1# to 10.# All valves flanged, and suitable for 475°F.

Other Foster Automatic Valves are available for every type of service. Foster Representatives in principal cities will work with you, without obligation, to help you with your engineering problems.

FOSTER ENGINEERING Company

PRESSURE REGULATORS...RELIEF AND BACK PRESSURE VALVES...AUTOMATIC STOP AND CHECK VALVES...ALTITUDE VALVES...DAMPER REGULATORS...FAN ENGINE REGULATORS...PUMP GOVERNORS...TEMPERATURE REGULATORS...LIQUID LEVEL CONTROLLERS...FLOAT AND LEVER BALANCED VALVES...NON-RETURN AND TRIPLE DUTY VALVES...VACUUM REGULATORS OR BREAKERS...SIGHT FLOW BOXES...STRAINERS...SAFETY VALVES...SIRENS

835 LEHIGH AVENUE • UNION, N. J.

with HOFFMAN
Heavy-Duty Vacuum Cleaning

Increased Productivity: Must machines and production workers stand idle while you attempt plant cleaning with old-fashioned methods? Or do you risk breakdowns and rejects while dust, metal chips and dirt accumulate in vital machinery and on production operations? Hoffman heavy-duty Vacuum Cleaning enables you to clean on regular periodic schedule, often during plant operations! Flexible tools and powerful suction remove dirt and dust from overhead areas, walls, floors quickly, thoroughly.

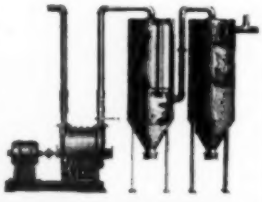
Better Quality Control: Is recurrent dust causing product damage—wasting valuable labor and materials? Hoffman Vacuum Cleaning has the answer to a higher rate of successful inspections. In all types of industrial plants Hoffman equipment is contributing to higher quality in the finished products; valuable materials are being salvaged. Let us consult with you on your problem.

Reduced Fire and Health Hazard: Is the nature of your dust sapping your workers' health and efficiency—creating a possible fire and explosion hazard? Perhaps taxing you with excess insurance? Then investigate how you can combat dust effectively, conveniently with Hoffman Vacuum Cleaning. Scores of industries rely on Hoffman equipment for safeguarding their men, machines and material against dust at overall low cost.

Write for Your FREE Survey

Hoffman builds stationary and portable vacuum cleaning equipment. For details, consult the Hoffman agent near you:

ATLANTA, GA.: A. J. Kroog, P. O. Box 9, Station E
DALLAS, TEX.: Tate & Roe Co., 5542 Dyer Street
EL PASO, TEX.: Boyd Engineering Co., 718 N. Stanton St.
HOUSTON, TEX.: Haylett O'Neill, 2510 Travis Street
HUNTINGTON, W. VA.: H. Y. Keeler, Box 1448
KNOXVILLE, TENN.: Leinart Engineering Co., P. O. Box 508
LOUISVILLE, KY.: J. F. Shouse & Co., 2100 Woodford Place
LYNCHBURG, VA.: Campbell King Co., P. O. Box 295
MEMPHIS, TENN.: Craig Sales & Eng'g Co., 1101 Poplar
NEW ORLEANS, LA.: H. J. Kelly, 816 Howard Avenue



AIR APPLIANCE DIVISION
U.S. HOFFMAN MACHINERY CORPORATION
115 FOURTH AVENUE, NEW YORK 3, N. Y.
CANADIAN PLANT: CANADIAN HOFFMAN MACHINERY CO. LTD. NEWMARKET ONT.

Cooper-Bessemer Plant Addition

THE COOPER-BESSEMER CORPORATION, Mt. Vernon, Ohio, builders of large gas and Diesel engines for locomotives, marine and power generation, has solved its expansion problem by the erection of a simple yet unique factory addition, centrally located with respect to existing production facilities.

By strategically locating the new addition, exceptional flexibility in operations has been made possible. Unexpected overloads in adjacent departments can now be easily absorbed by the new addition, eliminating cost-consuming and production-limiting bottlenecks.

◆

Foxboro—Baton Rouge

THE FOXBORO COMPANY, Foxboro, Mass., manufacturers of industrial instruments for measurement and control, announces the appointment of JOSEPH M. TEMPLE as Manager of its Branch Office located at 115 N. 19th Street, Baton Rouge, 8, La. He succeeds JOHN B. DEADERICK, now Manager of the Tulsa Office.

Mr. Temple, who has already assumed his new duties, is widely acquainted in Louisiana, having been born in that State and having received his education in Mechanical Engineering at the State University. Until recently he was Sales Engineer with the J. B. Beaird Co., of Shreveport, metal fabricators for petroleum refining and other heavy industries.

◆

State Docks Addition—Mobile

Transit shed construction for three new ships' berths, increasing storage facilities at the Port of Mobile by over 24 per cent, has been completed for Alabama State Docks and Terminals by THE RUST ENGINEERING COMPANY, Birmingham, Ala., and Pittsburgh, Pa., at a cost of $1,400,000.

◆

Russell Promotes Williams

BRUCE S. WILLIAMS, formerly manager of the southeast territory, belting division, RUSSELL MANUFACTURING COMPANY, Middletown, Connecticut has been appointed assistant to the president, it was announced recently by G. M. Williams, president of the Company.

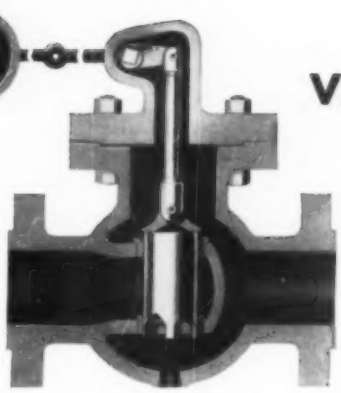
COPES BALANCED VALVES

Wherever you use float valves, avoid losing any of your operating force in the stuffing box. Insist on low and constant valve stem friction.

Make sure of instant, accurate response to your actuating force—no matter what your flows and pressures—by demanding close control of the unbalanced forces found in every valve.

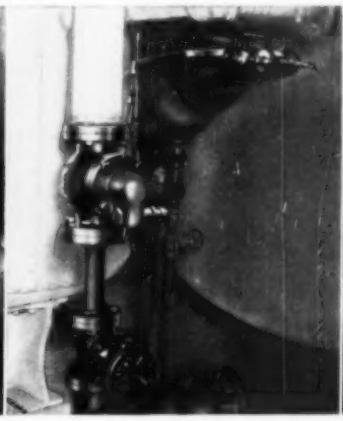
Provide for minimum pressure losses at high flows by requiring your valve ports to be accurately designed for the conditions you specify.

In other words—insist on COPES Balanced Valves. They offer all these important advantages—plus long service life with minimum maintenance. Write in detail about your needs.



With the COPES Type BI Valve, rotating stem means low stuffing box friction. Accurate balance assures quick and accurate response. Exact capacity you need is provided.

Float-operated COPES Type BI Valve controls flow of condensate from flash tank to storage tank.



Flow of blow-down water from a flash tank is controlled by this float-operated COPES Valve.

Water level in a deaerating heater is controlled by this float-operated COPES Balanced Valve.

NORTHERN EQUIPMENT COMPANY
203 GROVE DRIVE, ERIE, PA.

BRANCH PLANTS: Canada, England, France, Italy and Austria. *Representatives everywhere.*

Bulletin 443-B gives condensed data on all major COPES products. Write for a copy—your letterhead, please. Keep it for reference.

COPES

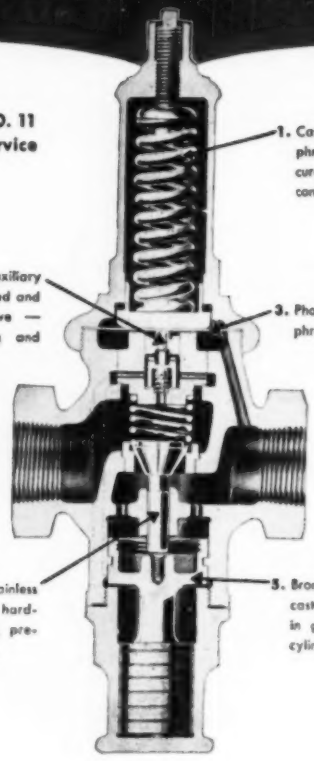
Headquarters for . . .

Boiler Feed Water Control . . . Excess or Constant Pressure Control, Steam or Water . . . Liquid Level Control . . . Balanced Valves . . . Desuperheaters . . . Boiler Steam Temperature Control . . . Hi-Low Water Alarms.

5 Quality Features

THAT ASSURE LOW COST PRESSURE REDUCING SERVICE

MASON NO. 11 for Steam Service



1. Carefully calibrated diaphragm spring insures accuracy throughout entire control range.
2. Stainless steel auxiliary valve unit, hardened and ground pilot valve — eliminates sticking and wire drawing.
3. Phosphor bronze diaphragm.
4. Special alloy stainless steel main valve, hardened and ground, prevents steam cutting.
5. Bronze piston fitted with cast iron rings operates in ground and polished cylinder.

The No. 11 Mason Reducing Valve assures precise pressure control in all types of applications. Pilot operation assures fast, accurate response to controlled pressure variations. Initial pressure ranges up to 250 lbs. reduced to any desired pressure between 5 and 75 lbs. or 75 and 225 lbs. Bronze bodies, screwed connections in sizes ½" to 2". Iron bodies, 250 lb. flanges in sizes 2½" to 4". Maximum working pressure 250 lbs. @ 450° F.

Your local Mason-Neilan industrial distributor is ready to serve you from his stock

MASON-NEILAN REGULATOR COMPANY
1206 ADAMS ST., BOSTON 24, MASS., U.S.A.

Sales Offices or Distributors in the Following Cities: New York • Buffalo • Chicago St. Louis • Philadelphia • Houston • Pittsburgh • Cleveland • Tulsa Atlanta • Denver • Cincinnati • Los Angeles • San Francisco
Mason-Neilan Regulator Co., Ltd., Montreal and Toronto

North Carolina Tissue Paper

The first (and only) tissue manufacturing plant in the south has been completed by CAROLINA PAPER MILLS, INC., at Rockingham, N. C.

The former Sonoco paper mill at Rockingham has been taken over for this purpose and is being thoroughly modernized and equipped with the newest high speed paper making machines, each with a productive capacity of 1,000 ft per minute. The plant will produce toilet tissue in white and pastel colors, wrapping tissue, textile cone wraps, waxed tissues and all grades of waxed papers.

All the personnel of the former Sonoco plant are being re-hired under the supervision of James A. Allender, formerly with Scott Paper Company and Windsor Locks Paper Corp., assisted by J. Dan Watford, formerly with Sonoco Products. H. Cafferata formerly with Dalemar Paper Corp. will be in charge of the Carolina Converting plant.

◆

Graver—Richmond

GRAVER WATER CONDITIONING CO., manufacturer of equipment for water conditioning processes, announces the appointment of Russell R. MACDONALD COMPANY as its sales engineering representative in the Richmond, Va., territory, with headquarters at Atlantic Life Building, Richmond 19.

The MacDonald organization, headed by Russell R. MacDonald, serves a number of industrial manufacturers in the territory, and has had wide experience in the engineering and sales of power plant equipment. It will handle all of the Graver water-conditioning equipment, including hot and cold process water softeners, zeolite water softeners and demineralizers, deaerating heaters, chemical feeders, and filters for removal of taste, odor, oil, iron, silica, etc. from water for boiler feed, municipal water supply, chemical process and general industrial purposes.

◆

Bergdoll Heads ASRE

JOHN G. BERGDOLL, JR., Vice-President and Works Manager of YORK CORPORATION, York, Pa., who has been associated with this air conditioning and refrigeration firm for approximately 28 years, was elected President of the AMERICAN SOCIETY OF REFRIGERATING ENGINEERS at the annual election of the organization held in December at the Edgewater Beach Hotel in Chicago.

Waterspheres are built in standard capacities from 25,000 to 150,000 gallons. Special designs can be furnished for capacities greater than 150,000 gallons.

the Horton Watersphere

Southern Power Plant uses latest style of streamline water tank

This 100,000-gal. Watersphere is one of the first of our new design erected in the South. It is located at the Cutler steam generating plant of the Florida Power and Light Company. In this latest version, we have made the Watersphere more streamlined and easier to maintain —without sacrificing any of the operating advantages of dependable elevated water storage.

Now, both the base and the spherical portion are faired smoothly into the central column to make the appearance even more streamlined, even more striking. The smooth surfaces which blend in with the graceful, sweeping lines of the Watersphere are the result of the butt-welded construction that is used.

All of the accessories, including the access ladder, are now *inside* the Watersphere. There are no exterior braces or rough corners to collect dirt and invite corrosion. It is easy to service the piping connections, the riser pipe, and the overflow because they are all located in the supporting column.

Whether you need a Watersphere or any other type of steel plate work, we offer prompt service to Southern industry from local sources. The Cutler tank, for example, was fabricated in our Birmingham plant and erected by a Southern crew supervised by our Birmingham Erection District Office. For estimates on elevated tanks or other steel plate work, write our nearest office.

CHICAGO BRIDGE & IRON COMPANY

Atlanta 3.....2180 Healey Bldg.
Birmingham 1.....1531 North Fiftieth St.
Boston 10.....1044—201 Devonshire St.
Chicago 4.....2107 McCormick Bldg.
Cleveland 15.....2218 Guildhall Bldg.
Detroit 26.....1534 Lafayette Bldg.
Houston 2.....2132 National Standard Bldg.
Havana.....402 Abreu Bldg.
Los Angeles 14.....1545 General Petroleum Bldg.
New York 6.....3312—165 Broadway Bldg.
Philadelphia 3.....1646—1700 Walnut St. Bldg.
Salt Lake City 1.....545 West 17th South St.
San Francisco 11.....1231—22 Battery St. Bldg.
Seattle 1.....1348 Henry Bldg.
Tulsa 3.....1628 Hunt Bldg.

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY, *and* GREENVILLE, PA.

In Canada—HORTON STEEL WORKS, LIMITED, FORT ERIE, ONT.

BELMONT 19 . . . for hot and cold water rods and plungers; low and intermediate steam rods.
BELMONT 30 . . . for high pressure steam rods, expansion joints, air, and gas.
BELMONT 6102 . . . for rod and valve stems handling volatile distillates.
cut equipment "down-time" with . . .
BELMONT PACKINGS
BETTER SEALING . . . LONGER LIFE

Idle equipment affects production schedules . . . influences product quality and many times cuts deeply into profits.

To keep equipment producing, use Belmont, the Packings that have individual characteristics and are scientifically designed and constructed by packing specialists to *seal better* and *last longer*.

Easy to get . . . Belmont Packings are stocked by local distributors in every large industrial center. Or, if you have a problem that requires special engineering attention, write direct.

Catalog #40 is available, write for it.

THERE'S A BELMONT PACKING FOR EVERY SERVICE

4-K-1

THE BELMONT PACKING AND RUBBER CO.
Butler and Sepviva Streets
Philadelphia 37, Pa.

BELMONT
PHILADELPHIA U.S.A.

RINGS • SPIRALS • COILS • REELS
SPOOLS • SHEETS • GASKETS

FOR STEAM • WATER • OIL • GAS • AIR • ACIDS • ALKALIES • AMMONIA

Electric Products—Houston

THE ELECTRIC PRODUCTS COMPANY has appointed the WILLIAM E. BRICE COMPANY, Houston, Texas, as District Representative for Southern Texas.

William E. Brice, a native of Texas, is a graduate electrical engineer from Rice Institute. In addition to his industrial experience with the General Electric Company, Houston Lighting and Power Company and the Wilson Electric Equipment Company, he is acquainted with oil field and refinery operations.

The William E. Brice Company will handle The Electric Products Company line of Battery Chargers, Electrolytic Equipment, Synchronous and Induction Motors, Frequency Changers, A—C D—C Generators and Industrial Dynamometers.

◆

"Electric Brain" Elevators

The six-story Interstate Life Building at Chattanooga, Tenn., will be served by elevators that provide uniform service to all floors—even during rush hours—at a speed of 400 feet per minute.

Westinghouse Electric Corporation has been awarded a $116,463 contract for the installation of three, 3500-pound capacity elevators. The automatic control that gives passengers on all floors an even break is called Selectomatic, a recent development of the Westinghouse Elevator Division. The "Brain" of the system is a network of electrical relays which respond to electrical "nerve" impulses created by the push-button signals. These impulses are passed along to a generator which runs a hoisting motor, and become virtual commands to stop, slow down, or go ahead. The result is a coordinated system of equally swift service to all floors, with shorter waiting times and faster round trips.

◆

National Tube Promotions

HARRY L. BIALOCK, manager of sales of NATIONAL TUBE COMPANY at Atlanta, Ga., has been promoted to manager of sales of the Tubing Specialties Division of this United States Steel subsidiary. He will make his headquarters at Gary, Ind., and succeeds David T. Marvel, who has resigned.

CHARLES J. LUNDVALL, previously a salesman in the New York district office of National Tube has been appointed manager of sales at Atlanta, Ga., to succeed Mr. Bialock.

Confused..

ABOUT THE PROPER FEEDWATER TREATMENT METHOD?

Hot Process? Cold Process? Ion Exchange?

ALL three (and combinations thereof) have advantages for the types of waters and heat exchange equipment used. None is universal in its application. Confused? Don't be—INFILCO can help you and your engineers select the right treatment method *and supply the correct treatment equipment* to convert your water supply to the quality of feedwater your plant requires. ☆It takes MORE than just chemicals, tanks, and exchange materials . . it takes *experience*—the type of experience INFILCO has gained through half a century of assisting plants like yours in solving their question of "WHAT treatment method?" Ask our Chicago Office or nearest field engineer, for complete information. No cost or obligation is involved. Or write for and return our Water Conditioning Analysis Sheet, promptly.

FREE LABORATORY SERVICE . . SEND FOR THIS WATER CONDITIONING ANALYSIS SHEET!

Make sure your water meets the exacting specifications you require. Send for our Water Analysis Sheet, then fill in and return it with a sample. You will receive our laboratory analysis and report promptly. A valuable INFILCO CHEMICAL CALCULATOR slide rule sent FREE to all who return our analysis sheet properly completed. *No cost or obligation is involved for this laboratory service.*

INFILCO

• BETTER WATER CONDITIONING AND WASTE TREATMENT SINCE 1894 •

INFILCO INC.

GENERAL OFFICES: 325 WEST 25th PLACE • CHICAGO 16, ILLINOIS

SALES OFFICES IN TWENTY SIX PRINCIPAL CITIES

WORLD'S LEADING MANUFACTURERS OF WATER CONDITIONING AND WASTE TREATING EQUIPMENT

LOWER PRICES

on EMERSON-ELECTRIC BELT-DRIVE

BALL-BEARING EXHAUST FANS

for Vertical or Horizontal Installation

Industrial installation of 48-inch Exhaust Fans, with automatic wall shutters.

Now is the time to head off "summer slump". . . combat fatigue and increase workers' efficiency with dependable Emerson-Electric Exhaust Fans. Substantial price reductions on the complete line of Belt-Drive, Ball-Bearing Exhaust Fans make proper ventilation an even better-paying proposition in 1950! Equipped with ball-bearing motors and special thrust shaft mountings, these powerful fans offer longer, quieter service, require less servicing, and may be mounted at any desired angle. Available in four blade sizes, 30", 36", 42" and 48", with capacities up to 19,350 CFM. Take advantage of Emerson-Electric's 60 years of ventilating equipment manufacturing experience. See your electrical contractor, or write for free Exhaust and Ventilating Bulletin No. 523.

DIRECT-DRIVE EXHAUST FANS

Available in 5 sizes, with blade sizes from 12 to 30 inches. Quiet-type overlapping blade assembly, fully-enclosed, ball- or sleeve-bearing motors.

THE EMERSON ELECTRIC MFG. CO., St. Louis 21, Missouri

EMERSON ELECTRIC
MOTORS • FANS APPLIANCES

Uniflo Gas Engine Compressor

WORTHINGTON PUMP AND MACHINERY CORPORATION conducted the initial shop test of its new Uniflo gas engine gas compressor recently at its Buffalo Works. Keen interest was shown by technical officials and engineers of many of the country's largest gas transmission companies who witnessed the test, in the performance of this revolutionary design of gas engine.

◆

Texas Power & Light Officers

JOHN W. CARPENTER was named chairman of the board, W. W. LYNCH, president and general manager, and LEE E. COOK, vice-president and assistant general manager of TEXAS POWER & LIGHT COMPANY at a meeting of the directors of the company following the annual meeting of stockholders at Dallas, Texas.

Mr. Carpenter is now completing his thirtieth year as general manager and his twenty-second year as president and general manager of the company.

Mr. Lynch has been in the service of the company for 26 years, has been vice-president since 1936, executive vice-president since 1947, and a director since 1938. He is a native Texan, born in Marshall. Following his graduation from Texas A. & M. College in 1922, he spent a year as a student engineer with Westinghouse Electric & Manufacturing Company at East Pittsburgh, Pa., first as sales correspondent and later as service engineer in New York City. In November, 1923, he entered the employ of Texas Power & Light Company, where he served successively as assistant to the efficiency engineer, construction supervisor, assistant to the superintendent of transmission and head of the distribution department, which position he held until he was moved to the executive department in 1936 and elected vice-president.

Mr. Cook, a native Texan, born at Jasper, was graduated from Texas A. & M. College in 1920, after which he entered the employ of the engineering department of Texas Power & Light Company. He has been with the Texas Power & Light Company during the entire time, in various capacities, except for a few years when he was on successive leaves of absence on engineering and executive work in connection with electric utility operations in Texas and elsewhere.

Reporting to the stockholders, Mr.

DIXISTEEL
BARS AND SHAPES
Southern made for Southern needs
More and more Southern manufacturers and fabricators are using DIXISTEEL Bars and Shapes—made from our own high-quality, open-hearth steel to meet the most exacting requirements.
Available in a wide variety of shapes, sizes and grades—plain or galvanized. Flexible rolling schedules assure prompt shipment.
Write today for complete information.
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MAKERS OF DIXISTEEL SINCE 1901
ATLANTA, GEORGIA

FARQUHAR CONVEYORS

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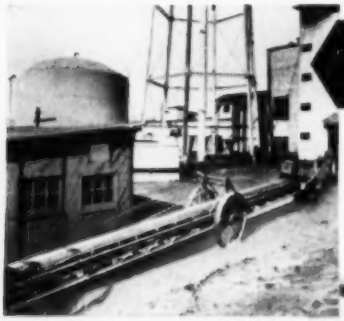
for users everywhere!

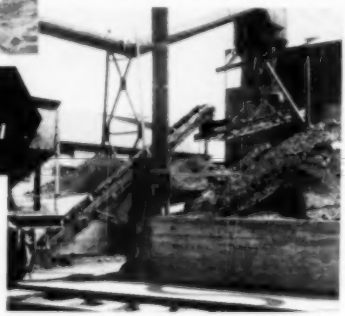


Farquhar Conveyor System SAVES Large Paper Mill $25,000 Annually!

A complete Farquhar Conveyor lineup at this leading Eastern Paper Plant speeds coal from railroad cars to pulverizing plant at the rate of 250 tons per day. The Farquhar Conveyor system consists of Model 346 units, placed end to end . . . saves the company over $25,000 a year in trucking charges!

Railroad Car Manufacturer SAVES Demurrage Penalties with Complete Farquhar Coal Handling System!

This complete coal handling system, including concrete retaining wall, swivel boom, and three Farquhar Conveyors, cut coal handling costs to the very bone for Mager Car Corp., Passaic, N. J.—paid for itself in less than a year!



EVERY day versatile Farquhar Conveyors are hard at work in plants all over the country, slashing demurrage costs . . . speeding up coal handling operations . . . releasing manpower for other work . . . saving money and making more profit for their owners! If you move materials horizontally or from floor to floor in your plant—coal, gravel, sand, aggregates, cartons, bundles, boxes, bales—any kind of bulk or packaged materials, get the facts on Farquhar to cut your handling costs to *rock bottom!* Farquhar offers you a complete line of portable, semi-permanent and permanent conveyors to do a faster, better, *cheaper* job of materials handling for you. Tell us about your problem. We'll be glad to work with you to solve it.

Farquhar CONVEYORS SAVE YOU MONEY

FREE INFORMATION

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283 Duke St., York, Pa., or
618 W. Elm St., Chicago 10, Ill.

Please send me information on the following: ( ) Farquhar Trough Conveyors ( ) Farquhar Package Conveyors.

Name .....

Company .....

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City ..... State .....

HYDRAULIC PRESSES • FARM EQUIPMENT • FOOD PROCESSING AND SPECIAL MACHINERY

Carpenter told about the progress made during the last year, stating that the company now serves more than 250,000 customers. He reported that, during 1948, the company enlarged its Brownwood power plant by the installation of two 2,250-kilowatt generators, built a new generating station at Clarksville of 1,000-kilowatt capacity, enlarged many of its substations and made a vast number of extensions and improvements to its transmission and distribution facilities. He stated that installation of a new 12,500-kilowatt turbo-generator at the Waco power plant has been completed this year and that the new 63,000-kilowatt turbo-generator at the Trinidad generating station would be ready for service late in the year.

Other officers of the company are Ted B. Ferguson, vice-president in charge of sales and advertising; Edward T. Keck, vice-president in charge of engineering and power; G. B. Richardson, vice-president; John C. Young, vice-president; George W. Beams, J. F. Skelton and W. B. Wright, assistant vice-presidents; George R. Marrs, treasurer and assistant secretary; W. G. Burnett, secretary and assistant treasurer; Frost Justiss and O. G. Osburn, assistant secretaries and assistant treaurers; C. S. Foster and A. J. Kleinman, assistant treasurers; and Eugene S. Wood, assistant secretary.

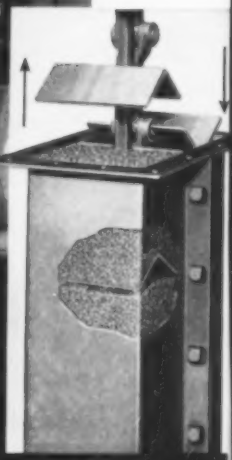
New directors elected Wednesday are E. L. Ashcroft, Jr., Sulphur Springs, and Mr. Cook. Directors re-elected are Messrs. Carpenter, Lynch, Ferguson, Keck and Young; Nathan Adams, H. L. Aller, Tyree L. Bell and H. L. Seay, all of Dallas; Stanton Brown, Waco; Tom H. DeLay, Tyler; S. G. Gernert, Taylor; A. G. Hopkins, Sherman; Lewis Johnson, Jacksboro; Thos. Johnson, McKinney; Ernest L. Kurth, Lufkin; Allin Mitchell, Corsicana; Pat M. Neff, Waco, and Maury Robinson, Paris.

◆

New Worthington Officers

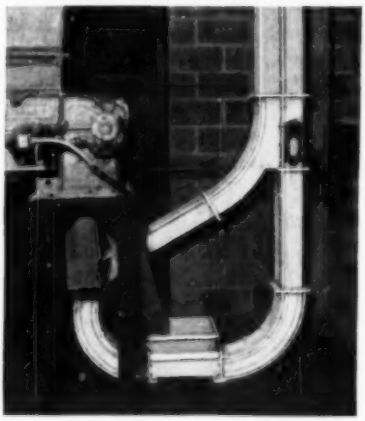
HOBART C. RAMSEY, new Worthington president, joined WORTHINGTON PUMP AND MACHINERY CORPORATION in 1920, after serving in World War I as a Lieutenant Commander. His first job with Worthington was as a sales engineer in the Export Department, becoming manager of that department in 1922. From 1925 to 1937, he served successively as assistant general sales manager, vice president in charge of international business, and vice president in charge of engineering and manufacturing operations, including seven years in Europe with Worth-

Cut-away view shows chain and flights.



LINK-BELT Bulk-Flo *Streamlines* Your Bulk Materials Handling

Illustrations above and below show typical vertical and horizontal runs of Bulk-Flo in flour mill.



Many types of bulk materials are handled at substantial savings in overall cost, with the simple, compact, Link-Belt Bulk-Flo conveyor-elevator-feeder. Moving steadily along in a compact mass, churning or degradation of the material being handled is minimized, and power consumption is held at a minimum.

The dust-tight casing is compact, occupies minimum space and is largely self-supporting, so that layouts are simplified. Multiple feed and discharge points can be located on horizontal runs.

Book No. 2175 tells the whole story, fully illustrated. Send for a copy and learn the advantages of Bulk-Flo in handling bulk materials in your operation.

TYPES OF LINK-BELT CONVEYING MACHINERY

Belt Conveyors
Screw Conveyors
Bulk-Flo Conveyors
Chain Conveyors
Trolley Conveyors
Apron Conveyors
Oscillating Conveyors
Flight Conveyors
Bucket Elevators
Bucket Carriers

LINK-BELT COMPANY

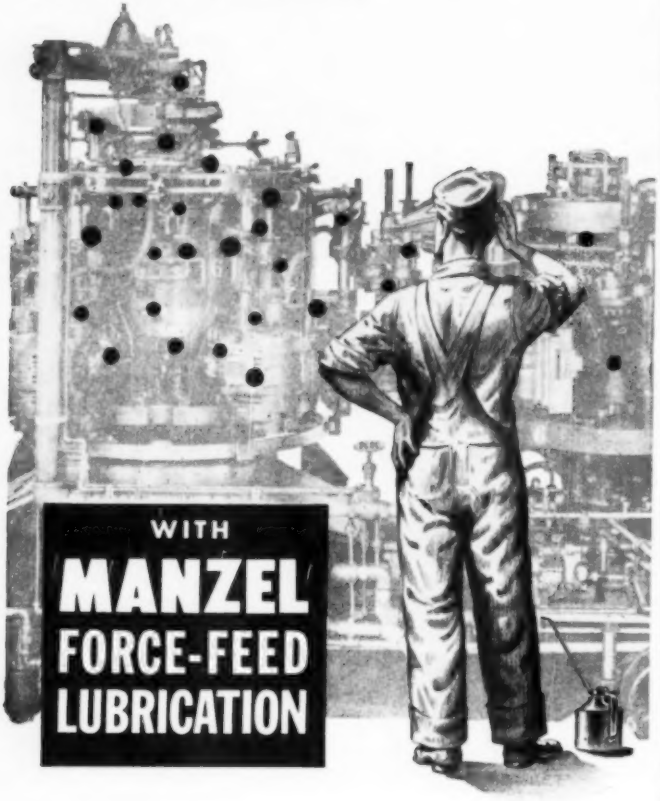
Chicago 8, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8.
Offices, Factory Branch Stores and Distributors in Principal Cities. 11.548

LINK-BELT

CONVEYING MACHINERY

"THE COMPLETE LINE"

CORRECT THESE SPOTS BEFORE HIS EYES!



WITH
MANZEL FORCE-FEED LUBRICATION

MANY spots requiring many different amounts of lubricant make it easy for a new man (or even an experienced one) to get all mixed up.

Manzel Force Feed Lubricators eliminate not only the confusion—but also the workman. For Manzels automatically lubricate any number of wearing points—no matter how hard to get at. Just enough of the right type of lubricant is always at each point.

Manzel Force Feed Lubricators save the initial cost many times over each year. They are supplied as standard equipment on various makes of engines, pumps, compressors, and other heavy machinery. Or they can be installed on your present equipment.

A Manzel representative will gladly give you technical assistance on your lubrication problem.

Write us now.

Manzel Inc. now supplies repair parts for all models of Bowser and Torrington Lubricators.

Builders of HIGH PRESSURE METERING PUMPS Since 1898

A Subsidiary of Frontier Industries, Inc.

318 Babcock Street Buffalo 10, N. Y.

Manzel INC.

ington's foreign operations. In 1945, Mr. Ramsey was elected executive vice president; and now succeeds Clarence E. Searle as president. Mr. Searle has been named vice chairman of the board of directors.

Succeeding Mr. Ramsey as executive vice president is EDWIN J. SCHWANHAUSSER, vice president in charge of sales since 1945, when he was transferred from Buffalo Works. He started with Worthington in 1915 as an engineer at the Harrison Works and has served successively as assistant manager at Harrison Works, manager of Buffalo Works, and appointed a vice president in 1939.

JOHN J. SUMMERSBY has been elected Vice President in Charge of Sales. Having joined the Worthington organization in 1916 and spending a year at the corporation 's former Cincinnati Works, he has been connected with the sales department ever since —first as a salesman and later as district office manager at St. Paul; sales manager at Holyoke Works; and assistant general sales manager. In 1937 he was appointed assistant vice president and general sales manager.

◆

Allis-Chalmers—Greensboro N. C.

New dealer for ALLIS-CHALMERS transformers and circuit breakers in the country's South Atlantic Section is the ELECTRIC SUPPLY & EQUIPMENT Co., Greensboro, N. C.

The company, organized in 1935, is representing Allis-Chalmers in the state of North Carolina east of and including Surry, Yadkin, Iredell, and Cabarrus counties; north of and including Stanly, Montgomery and Moore counties, and west of and including Lee, Chatham, Durham and Person counties. H. M. Sutherland is president of the firm and Otis W. Deese is in charge of product sales.

◆

Reynolds—Container Department

The Foil Division of REYNOLDS METALS COMPANY has organized a new Container Department with headquarters at Richmond which will be headed by George Du Charme, formerly Can Industry Manager for the company.

In addition to "Reynolds Pak," the new department will continue development of aluminum can and foil lined fibre container business through can manufacturers, as well as the future development of other foil containers of Reynolds manufacture, or products involving the development and sale of forming machines along with Reynolds products.

SAVINGS BONDS BUSINESS IS GOOD

and is good for business!

Your company benefits both directly and indirectly as you boost sales of U. S. Savings Bonds through the Payroll Savings Plan.

Direct benefits include decreases in absenteeism, labor turnover, and accidents—with a corresponding increase in production. How come? It's an intangible process *but one that has been demonstrated in more than 20,000 companies operating the plan.* Workers who invest regularly in Savings Bonds—the easy, automatic Payroll Savings way—become better workers. They feel more secure . . . are steadier and more careful in their work.

Indirect benefits accrue from the effect of Bond sales on the national economy—on which, of course, the future of all companies depends. That future becomes more secure because Bond dollars add up to a tremendous backlog of purchasing power—money that will buy *your* products or services in the years to come. What's more, Bond sales improve the equilibrium of our economy by spreading the national debt.

The experience of companies throughout the nation indicates that at least half of your employees can be persuaded to join Payroll Savings—without high-pressure selling. (The nation's biggest advertising program—built with *donated* space, time and services—is creating universal awareness that Savings Bonds pay $4 for $3 when they mature.)

HELP BUILD SECURITY—TAKE THESE STEPS IN YOUR COMPANY

1. See that top management sponsors the Plan.
2. Secure the help of the employee organizations in promoting it.
3. Adequately use posters and leaflets and run stories and editorials in company publications to inform employees of the Plan's benefits to them.
4. Make a person-to-person canvass once a year, to sign up participants.
5. Urge each new employee, at the time he is hired, to sign up.

For all the help you need, get in touch with your State Director, U. S. Treasury Department, Savings Bonds Division—or write the Savings Bonds Division, Treasury Department, Washington, D. C.

The Treasury Department acknowledges with appreciation the publication of this message by

SOUTHERN POWER & INDUSTRY

This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and The Advertising Council.

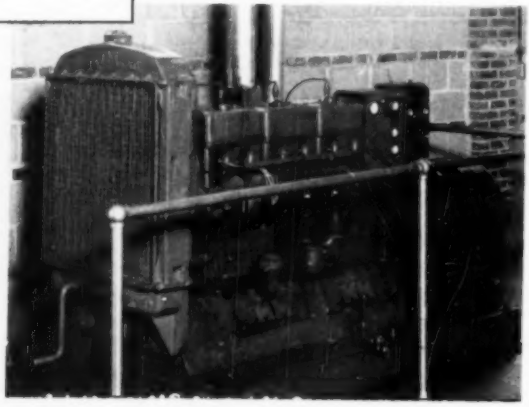
for HEAVY-DUTY and EASY HANDLING

it's MM MINNEAPOLIS-MOLINE MODERN MACHINERY INDUSTRIAL TRACTORS

The 27 H. P. RTI and the 49 H. P. UTI MM Industrial Tractor are modern material movers . . . masters of difficult material handling situations. Winches, cranes, loaders, pull-behind scrapers *quickly and economically* adapt the rugged MM wheel type Tractors to a wide variety of applications. 'V' type and reversible snow plows, rotary brooms, dozer blades, and MM side-mounted and pull-behind mowers adapt the MM for low-cost, efficient maintenance work. Cabs are also available for the protection of the operator.

Transport raw materials or finished products with cost-cutting, dependable MM Industrial Tractors that give year-around economical performance under the most severe conditions! Large diameter pneumatic wheels "cushion ride" heavy loads swiftly over all types of surfaces. Choice of two sizes to suit any job. Large load capacity front end and Ross steering assembly assure *EASY HANDLING* under all load and road conditions.

A complete line of MM Industrial Power Units from 25 H. P. to 230 H. P. offers economical power for all types of engine-driven equipment.



See your MM Dealer-Distributor or write

MINNEAPOLIS-MOLINE

MINNEAPOLIS 1, MINN.

Aluminum Gas Line

The first aluminum gas line to be installed in the nation is an all-welded line extending underground approximately 1.8 miles from the main trunk line of the ALABAMA-TENNESSEE NATURAL GAS CO. to the Listerhill, Alabama, plant of REYNOLDS METALS COMPANY. Installation is by LEHMAN HOGE & SCOTT of Sheffield, Alabama.

TECHNICAL BOOKS

Letter Symbols for Electrical Quantities

PUBLISHED BY AMERICAN STANDARDS ASSOCIATION. 70 East 45th St., New York 17, N. Y.
Price 60c.

The new edition of American Standard Letter Symbols for Electrical Quantities, replacing symbols adopted in 1928, represents one link in world wide agreement on a universal symbolic language for physical science.

Z10.5-1949, is a revision of an earlier American Standard Z10gl-1929. The revision was prepared by ASA Z10 Subcommittee No. 8 for use in science and engineering.

◆

Radiant Heating

BY T. NAPIER ADLAM
PUBLISHED BY THE INDUSTRIAL PRESS
148 Lafayette St.,
New York 13, N. Y.
6 x 9 inches—504 pages
Price, $6.00.

"Radiant Heating" is a treatise designed to answer hundreds of questions raised whenever this subject is under discussion. The author presents comprehensive information on heat input and output, relation of mean radiant temperature and air temperature, construction details, controls, air venting, effect of floor covering, and similar matters, all of which are of immediate concern to engineers, heating contractors, architects, and builders.

The final chapter includes 78 charts for the easy direct determination of the pipe size and spacing necessary, and covers both iron or steel pipe and copper tubing.

While the theory of radiant heating

is included, the emphasis in this book is on the application of radiant heating to actual problems.

●

Methods of Joining Pipe

By J. E. York
Published by The Industrial Press
148 Lafayette St.,
New York 13, N. Y.
5½ x 8½ inches—236 pages.
Price, $3.00.

"Methods of Joining Pipe" is a reference book for every engineer concerned with piping. It discusses the proper selection of pipe joints, based on such factors as the service for which the line is designed, temperature and pressure conditions, pipe size and pipe location, labor available for making the joints and for servicing after the line is installed, installation and maintenance costs, and ability to repair the joint without shutting down the system.

The test is grouped in the following ten chapters: screwed joints; methods of joining cast iron pipe; joints for thin wall tubes; for plumbing and chemical-resistant pipe; for vitreous tile and concrete pipe; for transit pipe; for wood pipe; and joints to permit movement.

●

Pump Questions and Answers

By Roy Carter, Igor J. Karassik, and Elliott F. Wright
Published by McGraw-Hill Book Co., 330 West 42nd St.,
New York 18, N. Y.
6 x 9¼ inches—346 pages.
Price, $5.00.

Written in question-and-answer form that ensures clear, concise presentation, this book covers the construction, application, operation, installation, and maintenance of pumps. It is made up of five major sections dealing respectively with centrifugal, vertical turbine, regenerative, rotary, and reciprocating pumps.

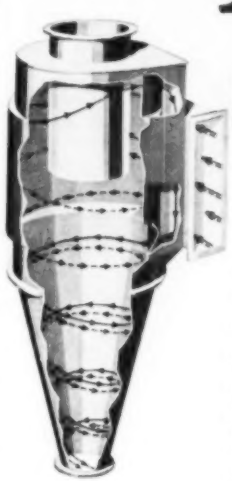
Each of the first four sections opens with a general description of a specific type of pump and its parts, and treats of the materials used in its construction. It then analyzes operating characteristics and the application of the pump, and discusses installation, operation, and maintenance. Each section concludes with a thorough treatment of pump troubles, symptoms, and causes, followed by a chapter on priming.

In the section dealing with reciprocating pumps, two chapters are given to the construction of simplex and duplex direct-acting pumps and horizontal and vertical power pumps.

An entire chapter has been de-

Countless angles to be checked in facing a

Fly-ash PROBLEM



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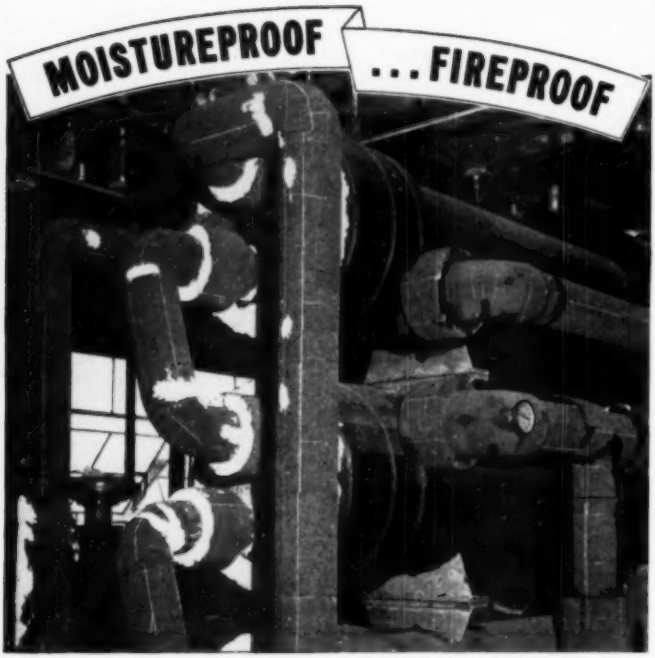
a foolproof formula that can be applied to all conditions. Each job requires individual engineering analysis... by *specialists*. Buell renders such a service, with no obligation to you. If a Buell Cyclone System can logically be recommended, it will be a tailored-to-the-job installation, of pre-measured and stated % efficiency. A Buell System naturally excells any ordinary cyclone, since it has the exclusive van Tongeren patented 'Shave-Off'. We invite your general or specific inquiry, and an opportunity to put service ahead of salesmanship. As a starter, let us send you the 32-page book, 'Engineered Efficiency'. Write: Buell Engineering Company, 70 Pine Street, Suite 5025, New York 5, N. Y.

buell Engineered Efficiency in DUST COLLECTION



This photo shows how PC Foamglas is used to insulate process equipment and pipe lines. The material is available in standard flat blocks, curved segments and beveled lags to fit equipment sides, heads and domes, and in preformed sections for standard pipe sizes and fittings. *Photo courtesy of North Brothers, Atlanta, Ga.*

PC Foamglas

...the permanent industrial insulation

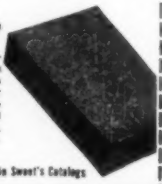
FOAMGLAS is not a fiber, not a wool. It is *all glass* composed of millions of tiny bubbles that prevent moisture and vapor travel. And unlike absorbent materials, the insulation value of Foamglas will not change even in humid or corrosive surroundings. Since it is a true glass, Foamglas is not only fireproof, but acidproof as well.

And PC Foamglas has long since proved its ability to maintain high or low temperatures, indoors and out. It has met all tests successfully . . . on tanks, towers, retorts and other large vessels . . . on piping and equipment and in a wide range of industries.

Our insulation specialists will be glad to help you work out your individual problems. Meanwhile, send the coupon for our free booklet on typical uses of Foamglas. We'll also include a free sample of this unusual, *permanent* insulating material.

This is FOAMGLAS®

The entire strong, rigid block is composed of millions of sealed glass bubbles. They form a continuous structure, so no air, moisture, vapor or fumes can get into or through the Foamglas block. In those closed glass cells, which contain still air, lies the secret of the material's permanent insulating efficiency.



For additional information see our inserts in Sweet's Catalogs

Pittsburgh Corning Corporation
Dept. AB-20, 307 Fourth Avenue
Pittsburgh 22, Pa.

Please send me, without obligation, a sample of PC Foamglas, and your free booklet on industrial insulation.

Name.....

Address.....

City.....State.....

PITTSBURGH PC CORNING **FOAMGLAS INSULATION**

When you insulate with **FOAMGLAS**... *you insulate for good!*

voted to the design and operation of the reciprocating-pump liquid valves, and a chapter has been given to the description of red, piston, and plunger packing; analysis of cushion chambers is also covered.

◆

Heat Power Fundamentals

BY CARROLL M. LEONARD AND VLADIMIR L. MALEEV
PUBLISHED BY PITMAN PUBLISHING CORPORATION, 2 West 45th St., New York, N. Y.
6 x 9¼ inches—596 pages.
Price, $5.75.

This book has been prepared for students who are taking the first course in Heat-Power Engineering. The first part of the book is devoted to a study of the steam power plant, with Chapter I introducing this type of plant and the plan for the development of its study. Chapter II covers the principles of Thermodynamics, and subsequent chapters are devoted to a study of the steam power plant, gas power plants—both of the reciprocating-engine and turbine types—and a description of mechanical refrigeration which furnishes a background for possible further study by the student of air conditioning.

To amplify and clarify the subject matter throughout the book examples are included, with solutions.

◆

Heating, Ventilating, and Air-Conditioning Fundamentals

BY WILLIAM H. SEVERNS AND JULIAN R. FELLOWS.
PUBLISHED BY JOHN WILEY & SONS, INC., 440 4th Ave., New York 16, N. Y.
6 x 9¼ inches—666 pages.
Price, $6.50.

The purpose of this second edition remains the same as that of the first edition—to present essential fundamentals of heating, ventilating, and air conditioning. Methods of application and the equipment available have changed during the past few years. Every effort was made to include at the time of the book's preparation all available authentic data which are readily applicable to heating and ventilating practice.

Additions and Revisions of the second edition include: a rearranged order and an enlarged presentation of material; nearly 200 pages of new material covering warm-air furnace heating, hot-water heating, panel heating, refrigeration, air purification, estimation of cooling loads, and air conditioning; new illustrations to replace obsolete ones, old illustra-

tions revised; specific data and design methods for panel heating systems; design procedure for summer and all-year air-conditioning systems; many new problems, only a few old ones have been retained.

The book is intended for engineers, architects and heating contractors, as well as for students of architecture and mechanical engineering.

Efficient Diffusion

(*Continued from page 79*)

Air entering a room passes through these cones, and because of their design, is reduced in velocity within the device. Simultaneously, air from the room—equal to about 35% of the incoming supply air—is siphoned into the diffuser where it is mixed with the incoming supply air.

The pre-mixed air then leaves the diffuser at a low velocity and spreads over a pre-determined area above the occupancy zone before slowly entering that portion of the room. Because the primary air mixing action takes place within the air-diffuser, and because all major air turbulence is limited to its vicinity, drafts are not perceptible to occupants.

It might be said that the air-mixture slowly diffuses into the room instead of sweeping in, as it does through grills at duct openings. Therefore, obstacles such as columns, machines and furnishings do not deflect the air flow. And stagnant air pockets—whether under-cooled or over-cooled—are eliminated.

The over-all result is even, draftless air distribution that causes both temperature and humidity to be closely equalized throughout the room.

Lay-Out Facts

However, before air can be distributed in this controlled pattern, various factors must be considered including the area of the room, height of ceiling, design of ceiling, locations of duct openings, duct sizes, duct velocities, permissible air velocities within the room, number of air-changes per hour,

Gives DART UNIONS

TIGHTER FIT
LONGER LIFE

Drop-tight! The non-corroding bronze seats of a Dart Union are precision-machined to a true ball joint. It's easy to make a Dart drop-tight without excessive wrenching.

Use Again and Again! They're less expensive, too. They uncouple easily—seats are uninjured—so you use them again and again.

Practically Indestructible! What's more, body and nut are made of practically indestructible air-refined malleable iron.

Remember a Dart Costs Less in the long run.

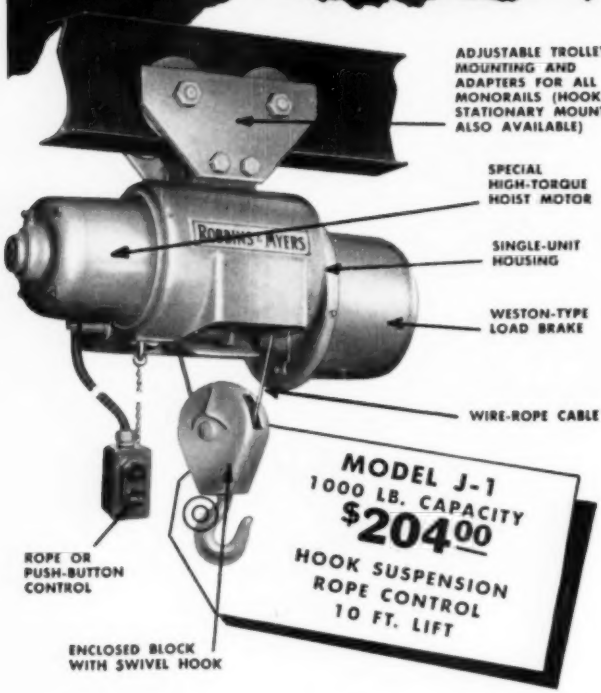
E. M. DART MFG. CO.
Providence 5, Rhode Island

DART
UNIONS

NEW! LOW-PRICED!

ROBBINS & MYERS

Wire Rope ELECTRIC HOIST



You asked for a low-priced Robbins & Myers electric hoist . . . here it is! Quality-engineered and manufactured by the experienced men who make much heavier R & M hoists, this new "J" hoist will end a lot more costly, back-breaking lifting, give skilled labor more time to use their skills.

Lug, hook or trolley mounting . . . adaptable to 7 different beam sizes . . . the reliable "J" hoist is versatile, easy to operate. Little headroom is required. High-torque motor tailored to your exact needs. Push-button control for accurate spotting. Single-unit housing assures positive alignment. This hoist is ruggedly built; requires little maintenance. Sizes ¼, ½ and 1 ton.

(WRITE FOR BULLETIN SP 451)

ROBBINS & MYERS • INC.

SPRINGFIELD 99, OHIO • BRANTFORD, ONTARIO

MOTORS • HOISTS • CRANES • FANS • MOYNO PUMPS

permissible sound levels, location of columns and other obstructions, the location, type and heat load of lighting fixtures, location of exhaust outlets, unusual concentrations of internal heat, solar radiation and other items.

Because of these various factors, one single design of diffuser could not be expected to solve all air-distribution problems. Therefore, different designs are used for different conditions. For example, in one recent plant installation, 180 air diffuser units were installed. Because conditions vary throughout the building, 72 of the devices are wall-type and 108 are ceiling-type diffusers. In some parts of this building, duct velocities exceed 1500 feet per minute, yet velocities in occupancy levels of rooms do not exceed 40 fpm—less than one-half mile per hour.

Smaller Ducts

Since aspirating diffusers circulate air of the highest duct velocities in a draftless pattern, they make it possible to install smaller ducts to handle larger volumes of air. Duct layouts also may be simplified through use of efficient diffusers, properly selected and located, to thoroughly distribute the air in spite of machines, columns, and other obstacles. Small ducts and simplified layouts enable a plant engineer to save space and reduce installation costs.

Air distribution does not end at the duct opening. Here, in fact, is where scientific air distribution begins. Distribution can make or break any air conditioning system, no matter what the cost.

Points to Remember

To those who are responsible for the installation of a new system, or are given the job of rectifying the faults of an old one, here's a bit of sound advice:

1. Employ the services of a trustworthy and competent engineering organization to study and plan your installation.
2. Do not "skimp" on installation cost at the expense of poor operation later.
3. Make doubly sure that you get perfect equalization of temperature and humidity by using proper diffusers.

Gruelling tests... *an essential part of every* LUNKENHEIMER VALVE!

RIGID TESTING, far above the usual practice, is regular procedure in the production of Lunkenheimer Valves. From selection of raw materials to final assembly, nothing is left to chance or guess. Each and every operation is gauged to meet the high quality standards which assure dependable performance, longer service life and minimum upkeep.

In gate valves, for example, a Lunkenheimer final test means that *every* valve is tested on both sides, at high and low pressure for seat tightness and then given a careful shell test. Spot testing is not tolerated.

This may be producing valves the "hard way", but for Lunkenheimer, it's the only way since it safeguards our proudest possession . . . the mark of unswerving quality and dependability.

Continually improved testing equipment, together with superior metallurgy and the most modern production equipment assures longer and trouble-free operation, making Lunkenheimer Valves cost less per year of service.

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Fig. 2150

150 lb. S.P. Bronze Gate

Like three valves in one. Number 2150 Double Disc, or Number 2151 Solid Wedge Disc, Rising Stem; or Number 2153 Single Wedge Disc, Non-rising Stem. How to convert one type to another by a simple interchange of trimmings is fully explained in Circular Number 574 available from your Lunkenheimer Distributor or direct.

Another assurance of better valve service

In the event of valve trouble, you need and can depend upon, quick service from your Lunkenheimer Distributor. His stocks and facilities shorten production tie-ups, save you dollars and hours. Whether it's an emergency, routine maintenance or new installations, phone your Lunkenheimer Distributor for fast, dependable service.

Leadership through Achievement!

NEW EQUIPMENT for Southern Industry

Hydraulic Control

C-1 REEVES PULLEY COMPANY, Columbus, Ind., has developed a new hydraulic control for use on the Reeves Vari-Speed Motodrive to provide a sensitive and accurate means of obtaining automatic speed changing.

The new development makes it possible automatically to control tension, velocity, pressure, temperature, liquid level of materials in process and to synchronize the operating speeds of machines in the production line or of parts of the same machine.

The actuating force is secured by connecting the control valve lever to any speed indicating mechanism on the driven machine. This may be floating roll, follower roll, temperature or pressure indicator, float, or moving parts. Pressure of only a few ounces will produce changes in output speeds.

The Motodrive is a complete variable speed drive which combines motor, speed changing mechanism and gear reducer in one unit. The control consists of a self-contained hydraulic power plant, and a simple rotary valve, piston and cylinder in a streamlined case, mounted on the Motodrive in place of the customary handwheel.

◆

7-Inch Sander

C-2 THE BLACK & DECKER MFG. CO., Towson 4, Md., has introduced a new popular-priced portable electric tool, the 7-inch Junior Sander, designed for service in shops requiring only intermittent sander use.

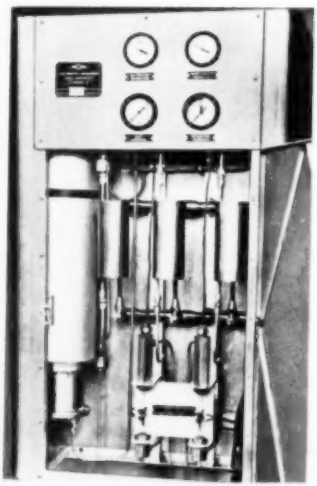
The 7-inch sander is recommended for light sanding, metal finishing, touch-up body work, removing rust, wood surfacing, and similar light-duty operations. It is a side handle model with a convenient reversible auxiliary side handle for either right or left handed use. The tool weighs only 8 lbs. Housings are aluminum castings and the sander has heat-treated gears and grease-sealed ball-bearings throughout. The no-load spindle speed is 3500 rpm.

◆

Automatic Degasser

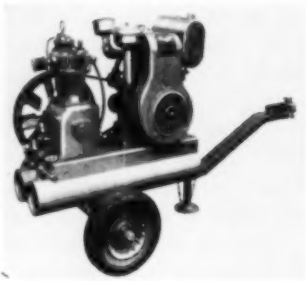
C-3 HAGAN CORPORATION, Pittsburgh, Pa., announces a new device designed primarily for use in determination of steam purity. Known as the Hagan Automatic Degasser, it produces continuously and automatically an approximately 50-50 split of a flowing steam sample—one fraction of the condensed steam containing any dissolved solids that may be present, and the other any dissolved gases.

The degasser is designed for automatic operation, simple installation, and small steam demand. The flowing steam and condensate contact only stainless steel.



Portable Compressors

C-4 THE GARDNER-DENVER COMPANY, Quincy, Ill., has developed a new line of trailer-mounted portable compressors designed for operating small air tools on service jobs. Their capacity is ample for operating paint spray guns, chipping hammers, light paving breakers, spaders, tampers and similar pneumatic equipment.



The units are furnished complete—the air-cooled compressor with V-belt drive to gasoline engine, mounted on a sturdy pipe tank type base. It is equipped with semi-pneumatic rubber tired roller bearing wheels, drawbar, trailer hitch and stabilizer leg, and can be towed behind a car or service truck.

◆

Air Operated Hydraulic Pump

C-5 LYON-RAYMOND CORPORATION, 9059 Madison St., Greene, N. Y., announces the introduction of a continuous acting air operated pump.

In operation, the new air motor is so arranged that it runs continuously by holding open the valve which controls the air supply. A reciprocating valve alternately diverts air pressure from one side of the air piston to the other. A relatively large air piston is directly connected to a small hydraulic piston which pumps oil under high pressure.

The pump is equipped with a built-in release valve to permit pressurized oil in the hydraulic cylinder to return to the reservoir by gravity. A single, three-position, four-way valve operates the release and controls the pumping action.

◆

Portable Vacuum Cleaner

C-6 The Breuer Mfg. Co., 5100 Ravenswood Ave., Chicago 40, Ill., have announced a Tornado portable vacuum cleaner especially suited for quick, thorough cleaning in close, confined places where larger industrial vacuum

cleaners are awkward and hard to handle.

Manufactured in four sizes equipped with 1/3 hp, 3/5 hp, 1 hp, and 1-1/3 hp motors with weights ranging from 7 lbs to 16 lbs, Tornado portable vacuum cleaners have universal motors mounted on permanently sealed bearings which require no greasing or oiling. Air intakes and suction openings are scientifically engineered and designed to secure a concentrated flow of air for cleaning which secures from 53 cu ft of air per minute in the smaller models up to 86 cu ft of air per minute in the 1-1/3 hp size.

◆

Ladder Leveling Device

C-7 The Anderson Products Co., P. O. Box 691, Tulare, Calif., have announced a "Hydra-lizer", which is a hydraulic ladder attachment that automatically corrects unlevel ground conditions and provides maximum safety for ladder users.

Inter-connected hydraulic units displace oil from one leg into the other as ladders are erected to correct differences in terrain from hillsides to

stairways. By moving a foot operated valve lever the ladder can be instantly locked in any position desired.

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Up to 24 x 3 x 3 Feet*

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RICHARDSON AUTOMATIC COAL SCALES give you this fully accurate record, automatically—hour by hour, shift by shift, week by week. Result: you spot instantly any coal-wasting boiler or other operating inefficiency... *keep power production costs at the minimum, power production itself at the peak.*

Coal is your biggest single item of expense. Be sure you're getting full capacity in b.t.u. and kw.-hr. from every boiler or turbine in your plant. Get all the facts on the economy, dependability and proven efficiency of RICHARDSON AUTOMATIC COAL SCALES. Write today for Bulletin 1143. It shows you how you can take a long step forward toward minimum coal costs... maximum power production.

RICHARDSON SCALE COMPANY CLIFTON, N. J.

630

Hydraulic Punches

C-8 BLACKHAWK MFG. CO., Milwaukee 1, Wis., has announced a new hollow-type hydraulic ram of 10-ton capacity for use with their remotely controlled hydraulic unit. The new hollow ram, known as the RC-426 connects to the standard Porto-Power P-76 pump and Z-913 hose for operation of all knock-out punches.

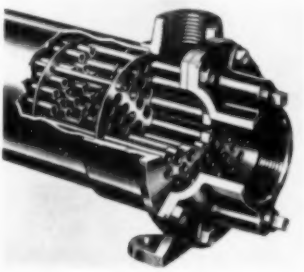
The manufacturer states that the hydraulic knock-out punches prevent distorted and loosened boxes; are suitable for use in limited spaces because there is no wrench to swing; punch accurate, uniform holes; prevent sudden breaks which throw the operator off balance; and minimize the need for scaffolds.

◆

Heat Exchanger

C-9 ROSS HEATER & MFG. CO., INC., 1407 West Ave., Buffalo 13, N. Y., is producing an all-stainless steel heat exchanger.

Identical in design and capacities to the Ross Type BCF exchangers which are all-copper and copper alloys, the new model, Type SSCF, utilizes stainless steel to avoid contamination of fluids or corrosion by fluids. It is offered in a complete range of sizes to 450 psi.



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Cooperage department settles dust problem with LIBERTY ENGINEERING SYSTEM

In the cooperage department of one of the nation's largest distillers, fine dust was a big problem . . . both inside and outside the plant. Liberty Engineering installed cyclone collectors and a "Roto-Clone" to stop the "wood flour." The management is happy and so is the neighboring residential district which was formerly exposed to the very fine dust from the plant.

This is but a single example of the way industrial problems are solved by Liberty Engineering & Mfg. Co. Submit your dust collecting, cooling, air conditioning and ventilating problems to our experts for analysis.

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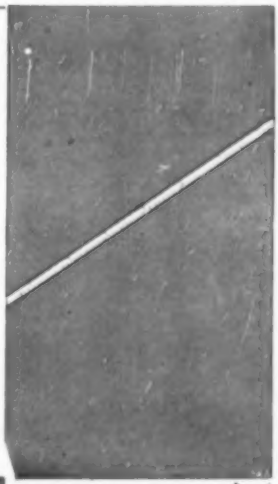
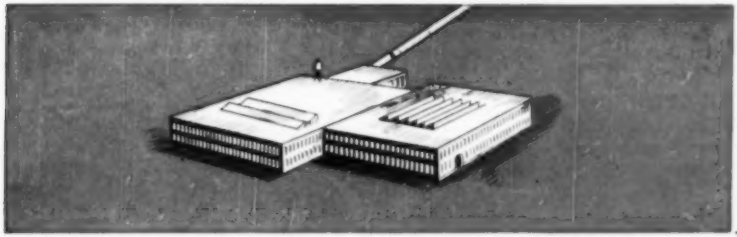
EFFICIENCY *Piped* TO YOUR PLANT

A great many plant executives are so engrossed in production problems they fail to recognize the significant part their heating and energy units play on their yearly balance sheets.

Too many of these managers take their fuel costs for granted; have never stopped to figure the increased efficiency, the instant, enduring savings which installation of Natural Gas would bring . . . savings from slashed costs of maintenance and other operating expense (due to near-automatic control), savings in constant steam pressure and the ease with which generation of this pressure is held close to load requirements.

This modern, highly adaptable fuel service is available in an ever increasing number of sections throughout the South. Ask your local gas company, or us, to tell you how you may take advantage of it.

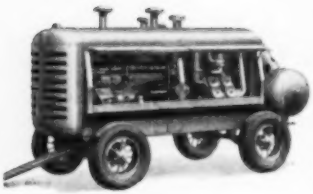




Natural GAS

SOUTHERN NATURAL GAS CO.

Birmingham Alabama



Air Compressor

C-10 INGERSOLL-RAND COMPANY, 11 Broadway, New York 4, N. Y., has announced a new diesel-driven 500 cfm portable air compressor, known as the IKA-500 Mobil-Air Compressor. The engine is the International-Harvester heavy-duty UD-24 which starts easily as a low-compression gasoline-engine and after a short warmup period is shifted to full diesel operation by means of a single lever.

This portable air compressor has all the features used on Ingersoll-Rand's KA-Series Mobil-Air compressors in sizes from 105- to 500 cfm. Full 500 cfm capacity is delivered at rated 100 psi pressure.

A-C Motor Starters

C-11 THE SQUARE D COMPANY, Industrial Controller Division, 4041 N. Richards St., Milwaukee 12, Wis., has announced a line of a-c magnetic starters designed to conform to latest NEMA standards for industrial control. Standard wiring and mounting dimensions have been adopted to simplify engineering, installation, and maintenance of machine controls.

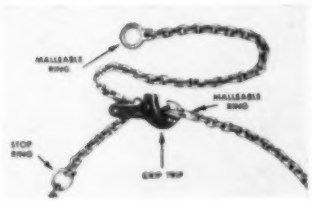
Sizes 0, 1, ad 2 open-type contactors and starters are made with standardized mounting dimensions; holding circuit interlocks are located to the left of the vertical centerline; NEMA standardized control and power wiring is furnished

Gas Flowmeter

C-12 THE FISCHER & PORTER COMPANY, Hatboro, Pa., has developed a new variable-area gas flowmeter known as the "Floguide". The tapered precision-bore metering tube and the "float" are fabricated from stainless steel. The metering tube is brazed to the cast iron inlet and outlet fittings, permitting simple panel installations. The extension below the metering tube carries an accurate metering scale, and an indicator below the float permits direct reading of flow rate. The wide-angle scale can be read from within a 180 degree arc and is also rotatable for complete flexibility of installation.

The Floguide is available in capacities ranging from 45 to 16,000 standard cubic feet of carbon dioxide per hour, 200 to 76,000 SCFH hydrogen, and comparable capacities for other gases.

◆



Sling Chain

C-13 THE CLEVELAND CHAIN & MFG. CO., Cleveland, Ohio, announces an improved cane sling chain known as "Round-Tite".

The standard 18 ft sling is made of ⅜" proof tested electrically-welded chain. A malleable ring is located on each end and a stop link inserted 8 ft from one end. A forged steel grip trip allows chain to slip through and tighten against the load. Slippage is prevented by the spring-operated grip trip latch which holds chain in position until latch is released. Tensile strength of chain is 9,300 pounds. It is proof tested to 4650 pounds. Weight, including grip trip, is 38 pounds. The chains are available in 20 and 22 ft slings, as well as the 18 ft, and also can be made to order.

Intended primarily for the handling of sugar cane, the slings can be used for the transporting of a variety of other products such as lumber, cloth bales, and boxes.

No. 401
DAVIS
DIAPHRAGM MOTOR VALVE
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NO. 401 is designed to give you everything you want in a sensitive diaphragm motor valve and pressure controller for pressure reducing service on steam, air, or gas. The controller may be mounted on the valve or installed remotely on an instrument panel. The valve is a spring loaded, balanced disc type of rugged construction suitable for indoor or outdoor installation. Offered in a complete range of sizes from ½" to 10" for initial pressures to 600 p.s.i. and any reduced pressure from 500 down to 1 p.s.i. When making inquiry, state service unit is to perform, size of valve required, and pressure and temperature specifications. The Davis line of pressure regulators is complete; there is a type and size for every purpose. Ask for Bulletin 100 A.
DAVIS REGULATOR COMPANY
2507 So. Washtenaw Ave., Chicago 8, Ill.
DAVIS

Angle Head Wrenches

C-14 SNAP-ON TOOLS CORPORATION, Kenosha, Wis., announces a series of angle head wrenches, designed for close-quarter work. Forged from alloy, high carbon steel, they are heat treated and tempered.

The heads of these wrenches are set at different angles—one 30 degrees and one 60 degrees—to the handle. As both heads on each wrench are the same size, switching ends permits turning nuts in narrow swing areas. Four wrench sizes are available with 7/16", ½", 9/16" and ⅝" openings.

◆

Handwheel Valve

C-15 HAMMEL-DAHL CO., 243 Richmond St., Providence 3, R. I., announces production of a new continuously connected handwheel control valve, which eliminates the necessity of the conventional bypass installation. It is possible to position the valve plug by hand under any conditions by turning the handwheel to the required position.

The valve plug position indicator automatically indicates the valve plug position, and shows the setting of the travel stops.

The handwheel will function equally well regardless of whether the valve is installed in a vertical or horizontal position. It is also possible to mount a chain wheel for remote operation. The handwheel may be applied to any Hammel-Dahl valve, size 1¼" through 16".

◆

Portable Honing Head

C-16 THE SUNNEN PRODUCTS COMPANY, 7910 Manchester, St. Louis 17, Mo., announces a new portable honing tool for sizing and finishing holes. This new tool, the "Honall", is used with portable drill, lathe or drill press. It is recommended for generating round, straight holes with accuracy as desired and with surface finish as fine as 2 micro-inches rms in hardened steel. Range covered is from 3/16" to 1", in all metals (except lead and babbitt), ceramics, and glass.

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MERCURY SWITCHES

Superior Quality and Workmanship

They are not affected by dust, dirt or corrosion and have many definite applications where open contacts are not suitable. Various types available. MERCOID is your guarantee of the best in mercury switches. Further information sent upon request.

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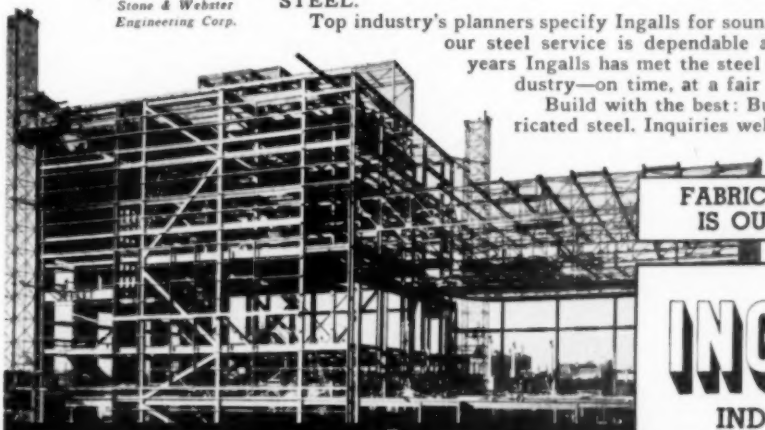

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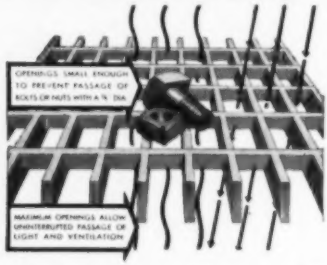
OPENINGS SMALL ENOUGH TO PREVENT PASSAGE OF BOLTS OR NUTS WITH A ½" DIA.
MAXIMUM OPENINGS ALLOW UNINTERRUPTED PASSAGE OF LIGHT AND VENTILATION

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Diagonal, or Super-Safety U-type Flooring, and stair treads of all types, are available. Bulletin KE 1140 describes the construction features of Tri-Lok Open Steel Flooring.

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CATALOGS AND BULLETINS

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B-10 **VALVES**—Bulletin E-160 14 pages—Describes and illustrates design and construction of general service valves; explains application to blow-off service and use on fire protection, chemical process, soot blower, water column blow-down, and other types of pipe lines. Includes tables of dimensions, weights, and price list.—EVERLASTING VALVE COMPANY, 49 Fisk St., Jersey City 5, N. J.

B-11 **COMPRESSORS**—Bulletin 203, 24 pages—Describes horizontal duplex heavy duty compressors, including air cushion valve. Discusses construction, dimensions, controls, operation. Illustrated with photographs and diagrams.—PENNSYLVANIA PUMP & COMPRESSOR CO., Easton, Pa.

B-12 **DIESEL ENGINES**—Bulletin No. 4812, 20 pages—Describes Diesel engines for stationary installations in municipal, public utility and industrial power plants. Illustrated with photographs of actual installations in specific plants.—THE NATIONAL SUPPLY CO., SUPERIOR ENGINE DIVISION, Springfield, Ohio.

B-13 **BOILER-STOKER COMBINATIONS**—Bulletin No. SF-1, 8 pages—Photographs and cut-away illustrations are used in describing the Brownell Unitbilt boiler-stoker combinations. Construction, assembly, rigging, and controls are discussed.—THE BROWNELL CO., 304 N. Findlay St., Dayton 1, Ohio.

B-14 **STEAM GENERATORS** — Bulletin PG-49-13, 12 pages—Package steam generators with ratings up to 35,000 lb of steam per hr with oil, gas, or coal firing, are covered by diagrams, photographs, tables, and other explanatory material.—FOSTER WHEELER CORP., 165 Broadway, New York 6, N. Y.

B-15 **INDUSTRIAL INSTRUMENTS** — Catalog Section 75, 24 pages—Describes line of Levelimeter instruments to indicate, measure and control liquid level and interface level. Units covered are magnetic tape-and-drum, electronically transmitting, ball-float, pneumatic and differential pressure; V-notch and weir and Parshall flume flowmeter instruments; and chemical service sight gauge glasses.—FISCHER & PORTER CO., 75 County Line Road, Hatboro, Pa.

B-16 **CORROSION RESISTANT VALVES**—Bulletin No. 3, 4 pages—Technical information is given on corrosion resistant jacketed valves designed for use in difficult applications. Illustrated with photographs and sectional views.—ALLOY STEEL PRODUCTS CO., INC., Linden, N. J.

B-17 **INSTRUMENT VALVES** — Bulletin No. 491, 4 pages—Describes new drop forged steel instrument valves for meter, gage, instrument, and other small lines. Contains dimensions, weights, prices, and operating data.—EDWARD VALVES, INC., East Chicago, Ind.

B-18 **TRANSFORMERS** — Bulletin 61B6382A, 8 pages—Describes dry-type transformer available in wide range of sizes suitable for duty right at the load center. Includes electrical and mechanical data on the transformers, which are built in single phase sizes of 1½ kva and larger, and 9 kvs and larger for three phase.—ALLIS-CHALMERS MFG. CO., S. 70th St., Milwaukee, Wis.

B-19 **ELECTRONIC CONTROLS**—Bulletin PG 4910, 62 pages—"Cutting Production Costs with Electronic Controls" cites case studies of control problems and includes information on packaged photoelectric and electronic controls. — PHOTOSWITCH INCORPORATED, 77 Broadway, Cambridge 42, Mass.

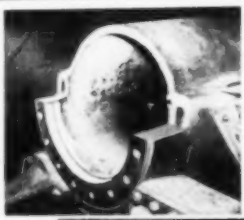
B-20 **CHEMICAL PUMPS** — Bulletin W-350-B11, 8 pages—Describes and illustrates centrifugal pumping equipment used in the chemical process industries. Explains the Worthington mechanical seal specially designed to prevent leakage of corrosive liquids and describes Worthite, the company's corrosion resistant metal.— WORTHINGTON PUMP AND MACHINERY CORP., Harrison, N. J.

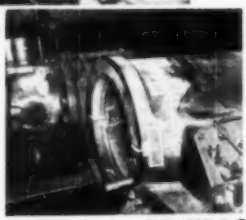
B-21 **INDUSTRIAL HEATING UNITS**—Bulletin "Here's News", 8 pages—Describes a new heating unit that can be used interchangeably as a steam boiler or hot water heater by adapting the control equipment accordingly. Explains the design and construction, and includes drawings and charts.—BLACK, SIVALLS AND BRYSON, INC., 720 Delaware, Kansas City 6, Mo.

B-22 **VENTILATION** — Bulletin 520, 6 pages—Mechanical ventilation of industrial structures to remove contaminated air and provide year-round ventilation with tempered fresh air by means of Dravo Counterflo warm air space heaters is discussed.—DRAVO CORPORATION, Fifth and Liberty Avenues, Pittsburgh 22, Pa.

B-23 **DEAERATING HEATERS** — Bulletin "Two Stage Deaerating Heaters", 8 pages—Outlines the principles of deaeration, describes the design, operation, and application of Graver deaerating heaters, and explains their distinctive features. Both vertical and horizontal types of heaters are shown.—GRAVER WATER CONDITIONING CO., 216 West 14th St., New York 11, N. Y.

B-24 **INDUSTRIAL STRAINERS** — Bulletin S-202, 4 pages—Fine screen strainers are illustrated and applications are discussed. Pressure and screen data tables





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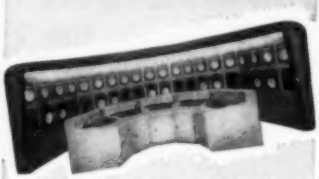

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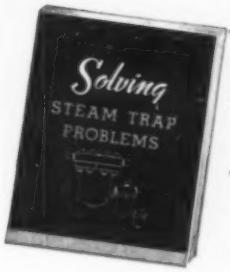

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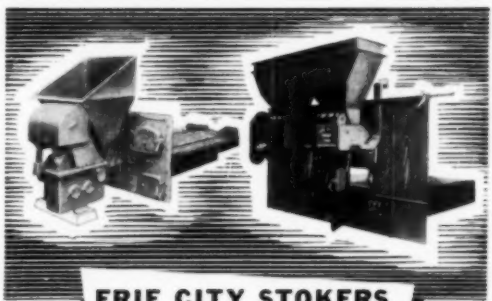

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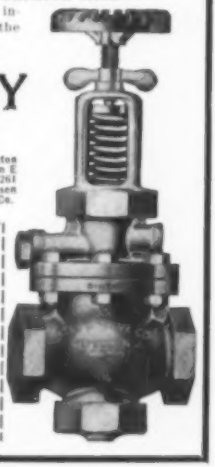

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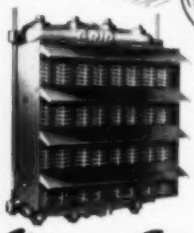

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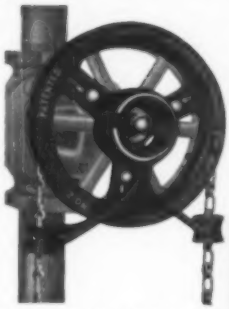

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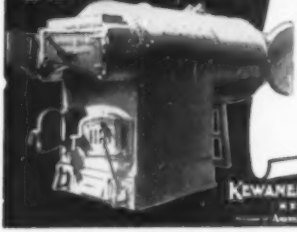

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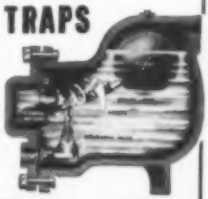

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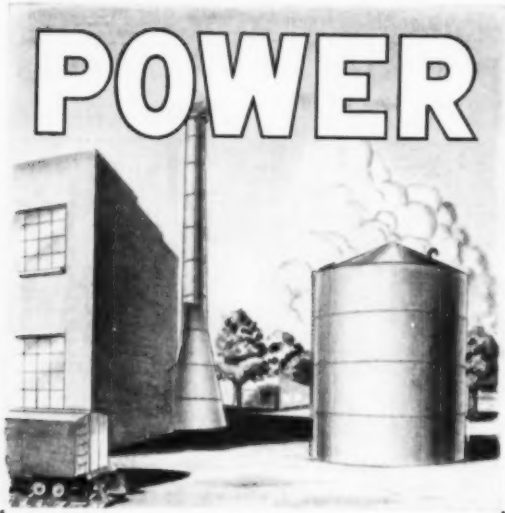

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• *Making Shapes From Boiler Plate Since Eighteen Hundred and Eighty-Eight* •

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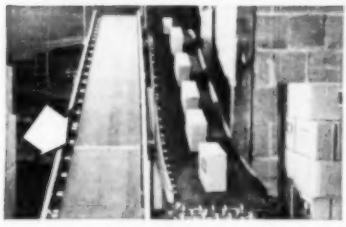

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BRONZE, FORGED STEEL, ALL IRON · FOR ALL PRESSURES AND TEMPERATURES

FOR BOILERS, TANKS, REFINERY SERVICE, ETC.

Fig. 5

Standard vertical bronze water gage, 350 pound design, heavier construction up to 450 lbs. Stainless and forged steel for higher pressures.

Fig. 8

All iron gages for pressure up to 250 lbs., heavier construction up to 350 lbs.

Fig. 855—Same fittings made in stainless steel.

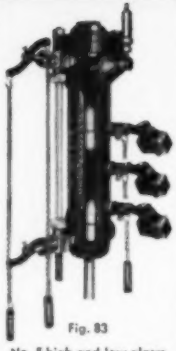

Fig. 83

No. 5 high and low alarm column with vertical gages and DCP weighted type try cocks.

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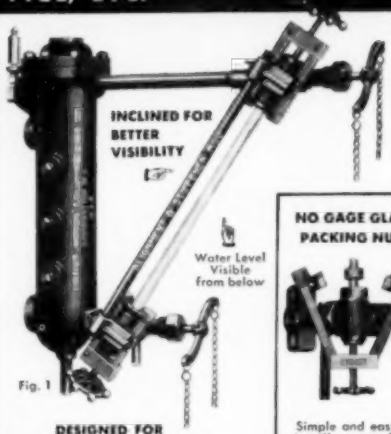

Fig. 1

DESIGNED FOR 250-450-650 LBS. W.S.P.

High and Low Alarm Column Equipped with Split-Gland Type Adjustable Inclined Water Gage

NO GAGE GLASS PACKING NUTS

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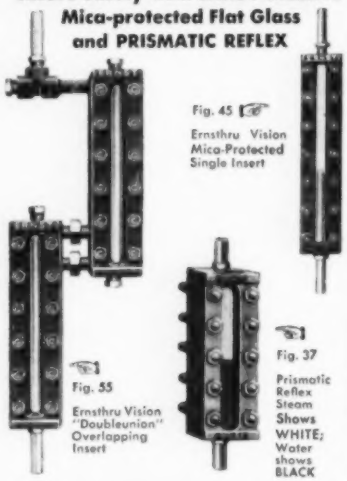

Fig. 45

Ernsthru Vision Mica-Protected Single Insert

Fig. 55

Ernsthru Vision "Doubleunion" Overlapping Insert

Fig. 37

Prismatic Reflex Steam Shows WHITE; Water shows BLACK

Fig. 10

Plain Sight Illuminator

Fig. 31

Ernst Plastic Guard, Replaceable Plates

ERNST LEAKLESS TRY COCKS

Designed for 450-650-1500-2500 lbs.

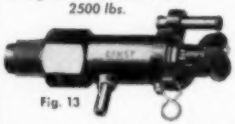

Fig. 13

Ernst Leakless Try Cocks Assure Maximum Safety

Fig. 01

Bronze, with Wheel

Weighted Type Try Cock

Fig. 15

250 lb. Pressure, Bronze, with Iron Weight Double Chain Pull

Spring Type Fig. AS-250

SIGHT FLOW INDICATORS

for insertion into pipelines

"See what's going on" . . . inside

Fig. 17-28

Tubular Glass Type

Fig. E-811

Flapper Type Single Window

Write Ernst

Fig. E-57

Bulls Eye Type Double Window

GAGE GLASSES—Tubular and Flat Type

FLAT TYPE REFLEX AND CLEAR

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High Pressure Composition RUBBER GASKETS

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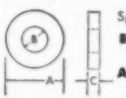

Specify:

B—Inside Diameter

A—Outside Diameter

C—Thickness

Fig. 21—Lip Mold Rubber Gasket

Fig. 22—Standard Rubber Gasket

ERNST WATER COLUMN & GAGE CO.

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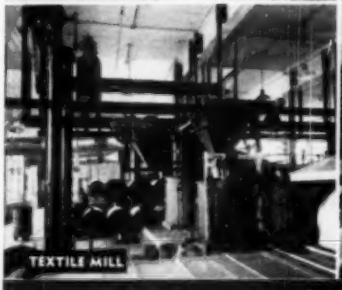
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Permutit® Sludge Blanket Hot Process!

here is a typical case history

A leading paper plant recently installed a Permutit Sludge Blanket Hot Process water softener. The results of several years' operation have been entirely satisfactory. Silica in the boiler feed makeup was reduced to 1/5 the amount previously obtained with a conventional type softener.

Look at the following figures, and you won't wonder that the plant's estimated annual savings on treating chemicals exceeded $6,000!

CHARACTERISTICS	Conventional Design	Sludge Blanket Design
Silica in raw water, as SiO_2 ppm	55	55
Silica in effluent, as SiO_2 ppm	11	2.0
MgO feed, ppm	76	59
Parts SiO_2 removed per part MgO	0.6	1.1
Average retention time of $Mg(OH)_2$ in hours	4.7	100
Contact time of water with $Mg(OH)_2$ in minutes	92	87
Hardness of effluent, as $CaCO_3$ ppm	21	15
Average load on softener, % rated capacity	65	46
Temperature in softener	220°F	243°F

The Permutit Hot Process offers your plant other benefits as well: More efficient use of magnesia! Longer filter runs! Lower turbidity in settling tank effluents! Greater adaptability to flow rate fluctuations! Here indeed is another achievement that spells "Permutit Leadership in Water Conditioning!"

Write for full information to the Permutit Company, Dept. P-2, 330 West 42nd Street, New York 18, N. Y., or to the Permutit Company of Canada, Ltd., Montreal.

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